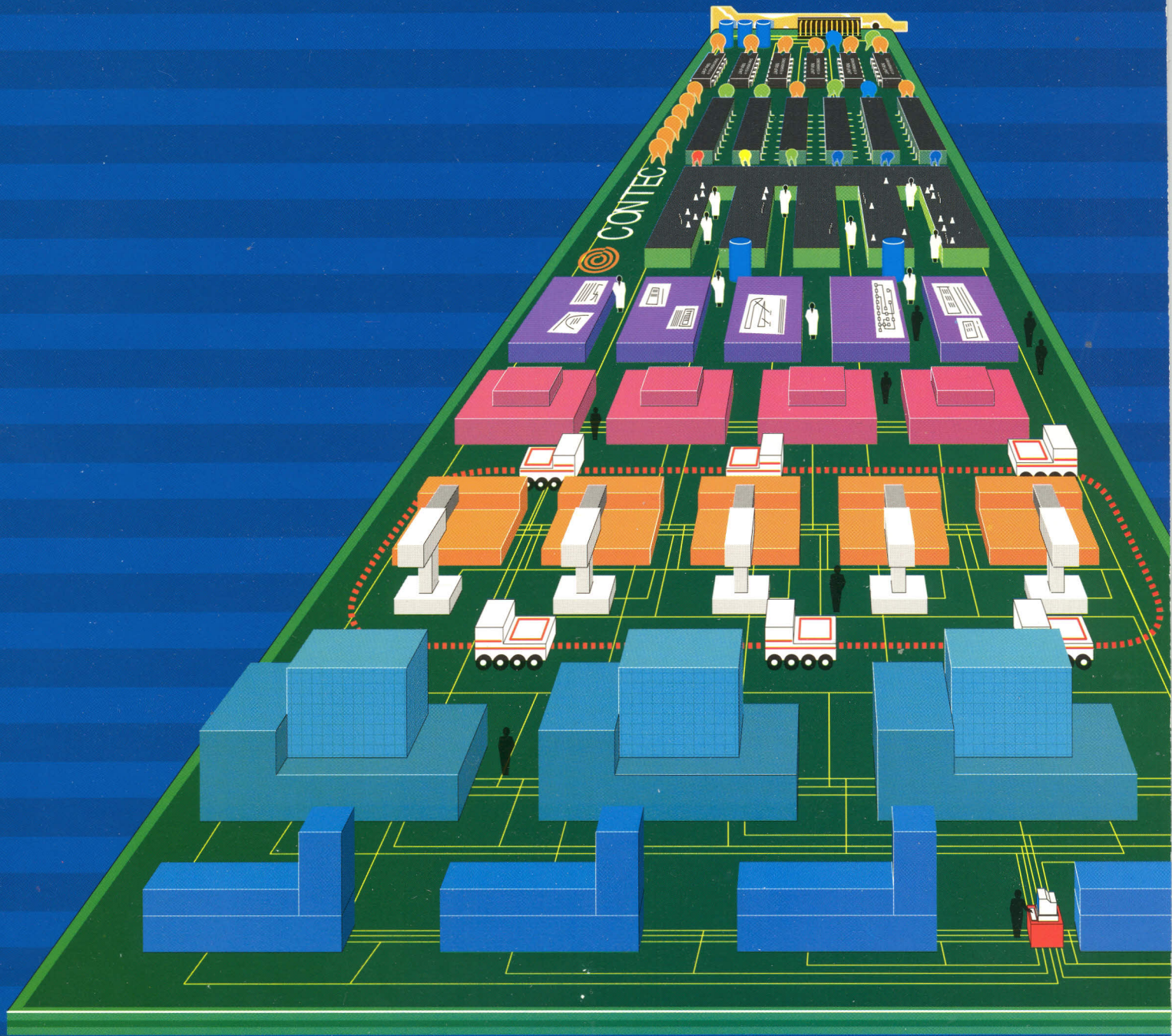


Factory and Lab Automation
Interface Boards for
IBM PC/XT/AT, PS/2
and Multibus Systems



CONTEC
MICROELECTRONICS U.S.A. INC.



PRODUCT
HANDBOOK
1989/90



Company Profile

For over a decade and a half CONTEC, (formerly Control Technology Ltd., Japan), has proven itself a pioneer and leader in the development and manufacture of computerized factory and laboratory automation systems, with emphasis on personal computer based data acquisition and control systems.

CONTEC supplies over 75 percent of all plug-in boards used on NEC and IBM personal computers in Japan. CONTEC has developed a wide range of factory and laboratory automation systems, custom-tailored computer products and innovative software for medical, scientific and industrial applications.

CONTEC is a subsidiary of Daifuku Ltd., Japan, a pioneer and leader in the field of computerized factory automation and material handling, with multinational operations.

CONTEC Microelectronics U.S.A. Inc., has been established to serve the U.S. market. It is the first Japanese company to offer such plug-in boards in the United States. Due to the predominance of IBM PC/XT/AT, IBM PS/2 and compatibles in the U.S. market, an additional development group has been set up in the U.S.

Today, CONTEC offers a whole range of interface boards for data acquisition and control in factory and laboratory environments, for the IBM PC/XT/AT, IBM PS/2 and compatible machines in North America, South America, Europe, Australia and the Far East; and additionally for the NEC-PC in Japan.

The range of products available from CONTEC U.S.A. includes, but is not limited to analog and digital I/O interfaces, timers/counters, communication interfaces, virtual memory boards, distributed data acquisition and control systems and necessary software.

All CONTEC products are designed for easy portability and rugged use in factory and laboratory environments. Each is constructed, assembled and inspected using the most stringent Japanese quality control standards and procedures. CONTEC U.S.A. is the only source of such plug-in boards to offer a three-year warranty against defects in workmanship.

CONTEC U.S.A. is located in San Jose, California and has a team of engineering and service experts, extensively trained at headquarters in Japan. They are available on a toll-free "hot-line" 1-800-888-8884, (9:00 am to 5:00 pm Pacific Time), to give customers fast personalized attention to technical or service questions.

Our goal is to serve you. Call us for solutions to your factory and laboratory automation needs, and see how our commitment to excellence will be put to use for you.

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Digital Boards

Name	Description	No. of Channels		I/O Signals				Throughput Speed (VDC)	Throughput Speed (max.)	No. of Interrupts	Additional Features															
				Level		5V - TTL	5V - LS-TTL					12 - 24VDC	48 - 60 VDC	Opto-Isolated	External Power (VDC)	CM-32	DT-Cable/0	DT-Cable/B	DT-Cable/0	DTP-1	DTP-2	DTP-R	DTP-S	MT/68 Cable	MT/S Cable	MTP-1
				In	Out																					
IBM PC/XT/AT																										
PI-32T	Digital inputs	32		•					1μsec	2		•	•			•	•						34			
PI-32L		32				•		•	12-24	1msec	2	•	•			•	•						34			
PI-32H		32					•	•	48-60	1msec	2	•	•			•	•						34			
PO-32T	Digital outputs		32	•					1μsec			•	•			•	•	•	•				37			
PO-32L		32				•		•	12-24	1msec		•	•			•	•					37				
PO-32H		32					•	•	48-60	1msec		•	•			•	•					37				
PIO-16/16T	Digital inputs & outputs	16	16	•					1μsec	2		•	•			•	•	•	•				40			
PIO-16/16L		16	16			•		•	12-24	1msec	2	•	•			•	•					40				
PIO-16/16H		16	16				•	•	48-60	1msec	2	•	•			•	•					40				
PIO-24/24L	Digital inputs & outputs	24	24		•		•		12-24	1msec	4		•	•	•	•	•						43			
PIO-48W	Digital I/O			48	•				1μsec	4	RS232C Port 3 timer/ counters		•	•	•	•	•						47			
PIO-48R				48	•				1μsec	5		•	•	•	•	•							47			
PIO-48C				48	•				1μsec	4		•	•	•	•	•							47			
PIO-96W	Digital I/O			96	•				1μsec	8		•	•	•	•	•							52			
IBM PS/2																										
mPI-48T	Digital inputs	48		•					1μsec	4										•	•	•	100			
mPI-48L		48					•		•	12-24	1msec	4								•	•	•	100			
mPO-48T	Digital outputs		48	•					1μsec											•	•	•	104			
mPO-48L			48				•		•	12-24	1msec									•	•	•	104			
mPIO-24/24T	Digital inputs & outputs	24	24	•					1μsec	4										•	•	•	107			
mPIO-24/24L		24	24				•		•	12-24	1msec	4								•	•	•	107			

Terminal Boards

Name	Description	Types of Outputs	Types of Outputs	Contact Rating	For Use with	Accessories	Page #
DTP-R	Relay outputs	16	Electro-magnetic relays with SPDT	120VAC/DC 1A	PO-32T, PIO-16/16T		120
DTP-S	Relay outputs	8 8	Solid state relays External driver circuits	280VAC, 60VDC 3A	PO-32T, PIO-16/16T	SSR-Solid State Relays	122

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Analog Boards

Name	Description	Analog															
		Inputs															
		# of Channels		Range						A/D Conversion		Additional Functions					
		Single-Ended	Differential	±2.5V	±5V	±10V	0-5V	0-10V	4...20mA	Resolution (in bits)	Throughput (Samples/Sec)	DMA	Prog. Gain	Prog. Sequence	Prog. Scan Rate	Foreground/Background Interrupts	
IBM PC/XT/AT																	
ADC-100	Multifunction	16	8		•	•		•		12	50,000	•			•	•	•
ADC-200	Multifunction with current loop	16	8		•	•		•	•	12	50,000	•			•	•	•
ADC-300	Multifunction with programmable gain	16	8		•	•		•		12	50,000	•	•		•	•	•
ADC-400	High speed multifunction For AT only	16	8	•	•	•	•	•		12	100,000	•		•	•	•	•
ADC-10	Analog Input	16	8		•	•		•	•	12	30,000					•	•
ADC-30	Low cost input	8	8		•	•		•	•	12	30,000					•	•
ADC-50	Low cost input with programmable gain	16	8	•	•	•	•	•		12	30,000		•			•	•
ADC-20	Analog output																
ADC-40	Low cost analog output																
ADC-80	Low cost analog output																
IBM PS/2																	
mADC-150	Multifunction	16	8		•	•		•		12	50,000	•		•	•	•	•
mADC-350	Multifunction with programmable gain	16	8		•	•		•		12	50,000	•	•	•	•	•	•
mADC-30	Low cost input	8	8		•			•		12	30,000					•	•

Timer/Counter Boards

Name	Description	No. of Channels	Counter Length (Bits)	I/O Signal Level			Max. Input Frequency	No. of Interrupts	Accessories			Page #
				5V TTL	12 - 24V with Opto-isolation				DT-Cable	DTP-1	DTP-2	
IBM PC/XT/AT												
TCG-10	Timer/Counter/Genertor	10	16	•	•	5 MHz	10	•	•	•		60
CNT 16-4M	Counter/timer	4	16	•	•	1 MHz int	5	•	•	•		56

	Analog								Digital		Other Features	Accessories																	
	Outputs								# of Channels																				
	# of Channels	Range						D/A Conversion																					
		±2.5V	±5V	±10V	0-5V	0-10V	4...20mA	Resolution (in bits)	Throughput (Samples/Sec)	Input		Output	Bidirectional	Timer/Counter	Real Time Clock/Calendar	Auto-Calibration	AT-2 Cable	ATP-1	ATP-2	ATP-M	ATP-M2	DT-Cable	DT-Cable/B	DT-Cable/O	DTP-1	DTP-2	MT/68 Cable	MT/S Cable	MTP-1
2	•	•	•	•	•		12	30,000			24	•		•	•	•			•	•	•	•	•				•	25	
2	•	•	•	•	•	•	12	30,000			24	•		•	•	•			•	•	•	•	•				•	25	
2	•	•	•	•	•		12	30,000			24	•		•	•	•			•	•	•	•	•				•	25	
2	•	•	•	•	•		12	50,000	8	8		3						•						•	•	•	•	30	
									4	4			•		•	•			•			•	•				•	•	1
									4	4							•		•			•	•		•	•	•	•	9
									8	8		3							•						•	•	•	•	16
2	•	•	•	•	•	•	12	30,000	4	4			•									•	•				•	•	5
4	•	•	•	•	•	•	12	30,000	8	8												•	•		•	•	•	•	13
8	•	•	•	•	•	•	12	30,000	8	8															•	•	•	•	21
2	•	•	•		•		12	30,000	8	8		3							•						•	•	•	•	95
2	•	•	•		•		12	30,000	8	8		3							•						•	•	•	•	95
							12	30,000	8	8		3							•						•	•	•	•	91

Analog Input Multiplexer Boards

Name	Description	Types of Outputs	Types of Inputs	Gain	For Use with	Accessories	Page #
ATP-M	Analog input multiplexer	16	mV, V, mA, A, Thermocouples	0.5/1/2/10/ /50/100/200/1000 or user defined	ADC-30	Cable included	117
ATP-M2	Analog input multiplexer	16	mV, V, mA, A, Thermocouples	1/10/100/200/500/1000 or s/w defined	ADC-50, ADC-400, mADC-30, mADC-350	MT/68 Cable	117

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Communication Boards

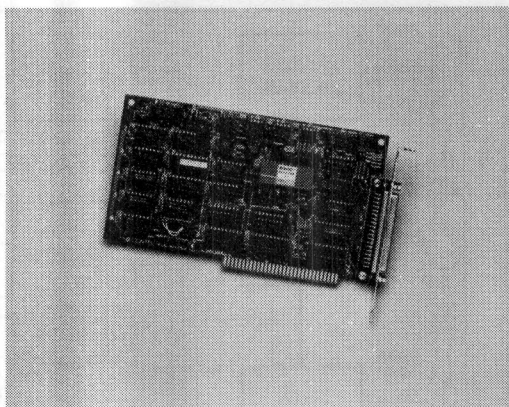
Name	Description	No. of Ports	Interface Type	Baud Rate	Accessories								Page #
					DT-Cable	DTP-1	DTP-2	RS422 Cable	RS232 Cable	MT1 Cable	Div 422 Panel	Div 232 Panel	
IBM PC/XT/AT COM-4M	Asynchronous Serial Communication	4	RS-232C/ RS-422	75 to 56,000				•	•				64
ICOM 8A	Intelligent Comm.	8	RS-232C	75 to 38,400							•	•	68
ICOM 8B	Intelligent Commn.	8	RS 422	75 to 38,400						•		•	68
GPIB (PC)	Gen. Purpose Interface Bus	4	IEEE-488	300,000 (Max. with DMA)									71
CR-NET	Remote Communication System	2	RS-485	2,400 to 19,200									73
IBM PS/2 mCOM 8A	Serial Communication	8	RS-232C	75 to 38,400							•	•	111
mCOM 8B	Serial Communication	8	RS-422	75 to 38,400						•		•	111
mICOM 8A	Intelligent Commn.	8	RS-232C	75 to 38,400							•	•	114
mICOM 8B	Intelligent Commn.	8	RS-422	75 to 38,400						•		•	114

Miscellaneous Boards

Name	Description	Accessories					Page #
		DT-Cable	DTP-1	STP-4IO Cable	BU-RAM Battery Backup	W-EPROM Burner	
IBM PC/XT/AT IRT-16	16-Channel Interrupt Handler	•	•				80
STP-2M	2-Axes Stepping Motor Controller			•			83
V-Disk	Virtual Memory with SRAM/EPROM				•	•	89

ADC 10

Analog Input Board



Features

- Plug-in board for IBM PC/AT/AT Bus
- 16 single-ended/8 differential analog input channels
- Voltage or current loop operation
- 12-bit A/D, 30,000 samples/second
- Auto-calibration
- Full interrupt handling capability
- Four digital input channels
- Four digital output channels
- High-level utility and application programs: Labtech Notebook, Labtech Acquire, Labtech Control, Unkelscope, Module-PAC

Specifications

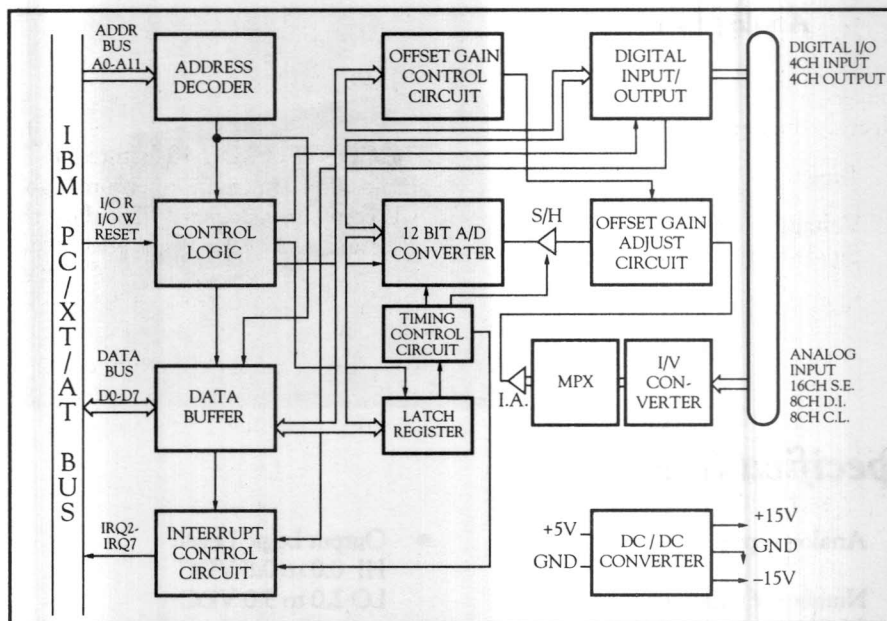
- Analog Input:
 - Number of Channels: 16 Single-ended/8 Differential
 - Full Scale Input Ranges: Bipolar $\pm 10V$ or $\pm 5V$; Unipolar 0 – 10V
 - Current Loop: 4 – 20mA
 - Input Impedance: $>1 M\Omega$
- A/D Conversion Resolution: 12 bits
 - Conversion Speed: 30,000 samples/s
 - Conversion Accuracy: $\pm 0.04\%$ FSR @ 25 °C
 - Zero Drift: ± 40 ppm FSR/°C
 - Differential Linearity Drift: ± 3 ppm FSR/°C
- Digital Input/Output:
 - Number of Channels: 4 Inputs, 4 Outputs
 - Type: TTL Compatible
 - Input Load: 1 LS-TTL Load
 - Fanout: 20 LS-TTL Loads
 - Input Logic Level: HI 0.0 – 0.8 V; LO 2.3 – 5.0 V
- Output Logic Level: HI 0.0 to 0.8 VDC; LO 2.0 to 5.0 VDC
- Interrupt Signals:
 - End of conversion
 - External interrupt signal
- Address Selection:
 - Any 4 byte boundary
- General:
 - Occupies one slot on IBM PC/XT/AT bus
 - Power Requirements: +5 V, 700 mA; +12 V, 5 mA; -12 V, 30 mA
 - Operating Temperature: 0 to 50°C
 - Storage Temperature: -40° to +70°C
 - Relative Humidity: 0 to 90%, Non-condensing
 - Dimensions: 4.2" x 8.7" x 1.0"
 - External connections via: one 37 pin D-type connector

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ADC 10

Functional Description

The CONTEC ADC-10 is a plug-in analog/digital conversion board for IBM PC/XT/AT computers. It is designed for applications requiring a combination of data acquisition and signal analysis capability. The ADC-10 provides 16 single-ended or 8 differential analog input channels, four digital input channels and four digital output channels. In addition, the board supports both voltage- and current-input operation and provides an auto-calibration circuit to ensure high A/D conversion accuracy.

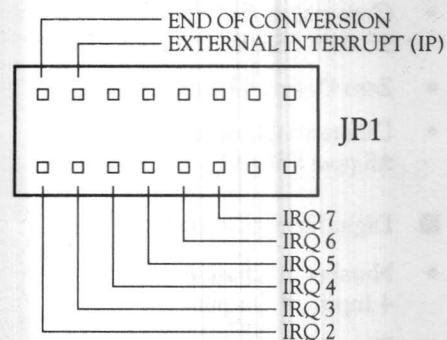


Setting Up Board I/O Address

The base address of the ADC interface board can be set using DIP switches. This board requires four consecutive addresses. Some addresses are reserved by the IBM-PC and other boards.

Interrupt Signals

This board generates two interrupt signals. These signals are sent to the CPU according to jumper settings on JP1, as shown below:



Input Selection

Jumpers are provided on-board for selecting the type and range of inputs

- Type:
 - Voltage or current loop
 - Single ended or differential
- Range:
 - $\pm 5V \pm 10V, 0 \dots 10V$

Input/Output Registers

The following tables show register port address assignments. Each register is actually located at the base address plus the offset specified. A slash indicates an unused bit.

WRITE REGISTER

	D7	D6	D5	D4	D3	D2	D1	D0
+0H	UNUSED							
+1H	A/D CONVERSION				CHANNEL SELECTION			
	START				C3	C2	C1	C0
+2H	POT. CONTROL				DIGITAL OUTPUT			
	STP	U/D			OP3	OP2	OP1	OP0
+3H	POTENTIOMETER SELECTION							
							GN	OF

READ REGISTER

	D7	D6	D5	D4	D3	D2	D1	D0
+0H	A/D CONVERSION DATA							
	2 ⁷	2 ⁶	2 ⁵	2 ⁴	2 ³	2 ²	2 ¹	2 ⁰
+1H	CONVERSION STATUS				CONVERSION DATA			
	BUSY				2 ¹¹	2 ¹⁰	2 ⁹	2 ⁸
+2H					DIGITAL INPUT			
					IP3	IP2	IP1	IP0
+3H	UNUSED							

Auto-Calibration Function

The CONTEC ADC-10 features an auto-calibration circuit to ensure high A/D conversion accuracy. To adjust the offset and gain of the input, enable the corresponding function bits (OF and GN) and the up/down bit (U/D) at the base addresses +3H and +2H respectively, and issue pulses to the step bit (STP). Calibration software is included with the ADC-10 board for your convenience.

Data Coding Example

For analog-to-digital and digital-to-analog conversion, the following formulae convert the corresponding digital word to the voltage level:

Bipolar:

$$\text{Voltage} = \frac{\text{Digital value} - 2048}{4096} \times \text{F.S.R.}$$

Unipolar:

$$\text{Voltage} = \frac{\text{Digital value}}{4096} \times \text{F.S.R.}$$

Where F.S.R. = Full Scale Range

For example, if the voltage range is ± 5 volts bipolar and the digital value is 3500 (DACH), the corresponding analog voltage is as follows:

$$\begin{aligned} \text{Voltage} &= \frac{3500 - 2048}{4096} \times \text{F.S.R.} \\ &= \frac{1452}{4096} \\ &= 3.5049 \text{ Volts} \end{aligned}$$

Interface Connector

The external trigger input, digital I/O and all analog inputs are made through a 37-pin female D-type connector. The pin assignments are as follows:

+5V	1	20
	2	21
OP3	3	22
OP1	4	23
IP3	5	24
IP1	6	25
DIGITAL GND	7	26
	8	27
	9	28
	10	29
CH7 LO/*CH15 HI IN	11	30
CH6 LO/*CH14 HI IN	12	31
CH5 LO/*CH13 HI IN	13	32
CH4 LO/*CH12 HI IN	14	33
CH3 LO/*CH11 HI IN	15	34
CH2 LO/*CH10 HI IN	16	35
CH1 LO/*CH9 HI IN	17	36
CH0 LO/*CH8 HI IN	18	37
ANALOG GND	19	

*ALTERNATIVE CONNECTIONS APPLY IN 16 CHANNEL SINGLE ENDED INPUT CONFIGURATION

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ADC 10

Software

The assembly driver program included with the ADC-10 provides a set of high level functions for communicating with and controlling external devices. Each function is designed for flexibility in developing software-controlled or interrupt-driven applications. A/D conversions may be made in single conversion mode or by using multiple scans in any channel sequence. The digital I/O and system functions support a variety of data acquisition system applications. All functions can be called in IBM interpretive BASIC, GWBASIC, TurboBASIC or QuickBASIC. The following is a list of all function calls:

INIT Initializes system & loads interrupt service routine

ENABLE Enables an IRQ level

DISABLE Disables an IRQ level

RDSTAT Reports the current interrupt mask status

TRSM2A Transfers data from memory area to an array

TRSA2M Transfers data from an integer array to a memory area

A2DCHNL Sets an array to store channel numbers in desired sequence

A2DDATA Sets a data array for storing converted data

CNVMODE Selects software-controlled or interrupt-driven conversion mode

A2DIN Issues single A/D conversion

GOCNVR Issues multiple A/D conversion

WRITDO Sends data to digital output port

READDI Reads status from digital input port

RESETIRQ Releases interrupt service routine

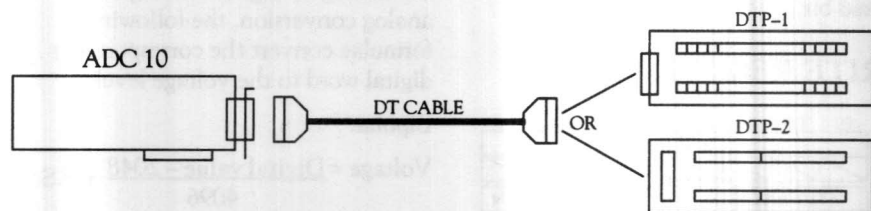
Application Software

Labtech Notebook	p.132
Labtech Control	p.134
Unkelscope	p. 136
Module-PAC	p.145
Acquisition Engine	

Accessories

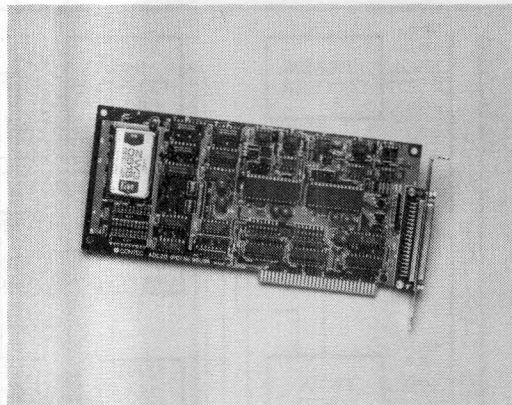
- A. Included with board
 - 1. D-Connector (loose)
 - 2. Users Manual
 - 3. Floppy disk containing software drivers, auto-calibration program and sample programs
- B. Optional – to be ordered extra
 - 1. Terminal Panels DTP-1 or DTP-2 (see page 126)
 - 2. Interconnection cables DT-Cable (see page 127)

Product Configuration



ADC 20

2-Channel Analog Output Board



Features

- Plug-in board for IBM PC/XT/AT Bus
- 2 analog output channels
- Voltage or current loop outputs
- 12-bit D/A, 30,000 samples/second maximum
- Full interrupt handling capability
- Four digital input channels, four digital output channels
- Auto-calibration

Specifications

■ Analog Output:

- Number of Channels: 2
- Output Ranges:
Bipolar ± 10 V, ± 5 or ± 2.5 V;
Unipolar 0 – 5 V; 0 – 10 V
Current Loop: 4 – 20 mA

■ D/A Conversion

- Resolution: 12 bits
- Conversion Accuracy:
 $\pm 0.05\%$ FSR @ 25°C
- Conversion Method:
Ladder resistor network
- Conversion Speed:
30,000 samples/s
- Slew Rate: 10 V/ μ s
- Settling Time to $\pm 1/2$ LSB:
7 μ s, 20V step
- Capacitive Drive Capability: 0.5 μ F
- Output Current: ± 5 mA
- Thermal Characteristic:
 ± 50 ppm FSR @ 25°C

■ Digital Input/Output:

- Number of Channels:
4 Inputs, 4 Outputs
- Type: TTL Compatible
- Input Load: 1 LS-TTL Load
- Fanout: 20 LS-TTL Loads
- Input Logic Level:
HI 0 – 0.8 V;
LO 2.3 – 5.0 V
- Output Logic Level:
HI 0 – 0.8 V;
LO 2.0 – 5.0 V

■ Interrupt Signals

- External Interrupt Signal

■ Address Selection

- Any 4 byte boundary



ADC 20

Specifications (Continued)

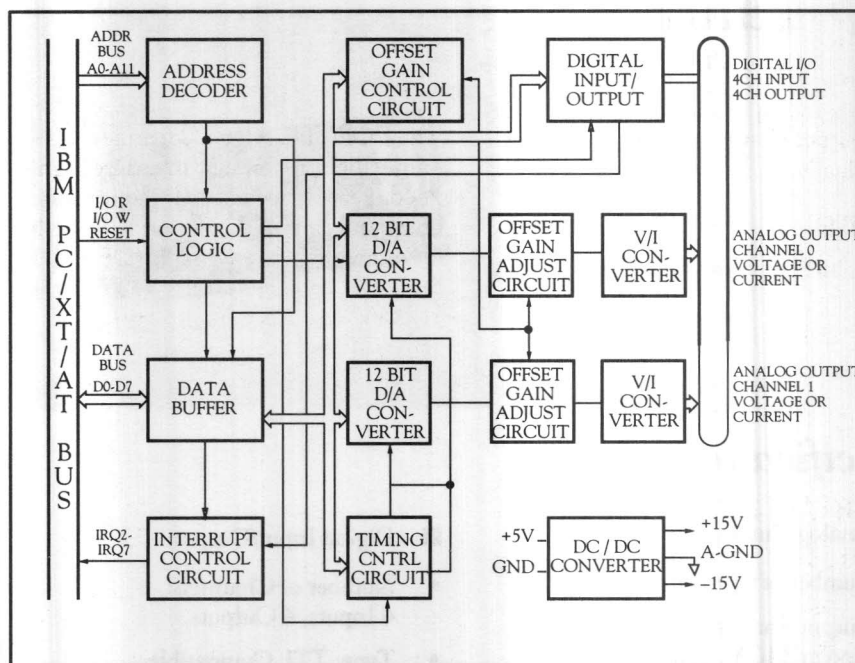
General

- Occupies one slot on IBM PC/XT/AT bus
- Power Requirements:
+5 V, 700 mA;
+12 V, 5 mA
- Operating Temperature: 0 to 50°C
- Storage Temperature:
-40° to +70°C
- Relative Humidity:
0 - 90%, Non-condensing
- Dimensions: 4.2" x 8.7" x 1.0"
- External connections via:
one 37 pin D-type connector

Functional Description

The CONTEC ADC-20 is a plug-in digital/analog conversion board for IBM PC/XT/AT computers. Designed for applications requiring fast, accurate voltage or current loop outputs, it provides two non-isolated output channels, four digital input channels and four digital output channels. In addition, it provides an auto-calibration circuit to ensure high D/A conversion accuracy.

The ADC-20 supports six output ranges: ± 2.5 V, ± 5 V, ± 10 V, 0 - 5 V, 0 - 10 V, and 4 - 20 mA for process control. The 12-bit D/A conversion has a throughput of up to 30,000 samples/sec. The ADC-20 also provides an interrupt input line to support real-time data acquisition applications.

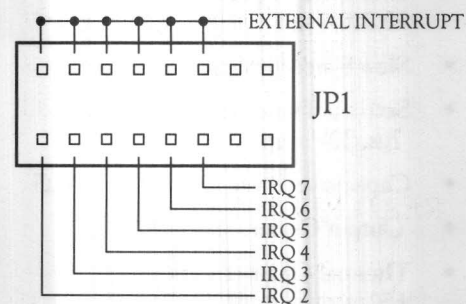


Setting Up Board I/O Address

The base address of the ADC interface board can be set using DIP switches. This board requires four consecutive addresses. Some addresses are reserved by the IBM-PC and other boards.

Interrupt Signals

This board provides one interrupt signal line to accept the external interrupt via Pin 25 (IP0). This signal is sent to the CPU according to jumper settings on JP1, as shown below:



Output Selection

Jumpers are provided on-board for selecting the type and range of outputs. Each output channel can be configured individually.

- Type:
 - Voltage or current loop
- Range:
 - Bipolar $\pm 2.5\text{ V}$, $\pm 5\text{ V}$, $\pm 10\text{ V}$
 - Unipolar 0 to 5V, 0 to 10V

Input/Output Registers

The following tables show register port address assignments. Each register is actually located at the base address plus the offset specified. A slash indicates an unused bit.

WRITE REGISTER

	D7	D6	D5	D4	D3	D2	D1	D0
+0H	D/A CONVERSION DATA							
	2 ⁷	2 ⁶	2 ⁵	2 ⁴	2 ³	2 ²	2 ¹	2 ⁰
+1H	CHANNEL SELECTION				CONVERSION DATA			
			CS1	CS0	2 ¹¹	2 ¹⁰	2 ⁹	2 ⁸
+2H	POT. CONTROL				DIGITAL OUTPUT			
	STP	U/D			OP3	OP2	OP1	OP0
+3H	POTENTIOMETER SELECTION							
					GN1	OF1	GN0	OF0

READ REGISTER

	D7	D6	D5	D4	D3	D2	D1	D0
+0H	UNUSED							
+1H	UNUSED							
+2H	DIGITAL INPUT							
			IP3	IP2	IP1	IP0		
+3H	UNUSED							

Auto-Calibration Function

The CONTEC ADC-20 features an auto-calibration circuit to ensure high D/A conversion accuracy. To adjust the offset and gain of the output, enable the corresponding function bits (OF and GN) and the up/down bit (U/D) at the base addresses +3H and +2H respectively, and issue pulses to the step bit (STP). Calibration software is included with the ADC-20 board for your convenience.

Data Coding Example

For analog-to-digital and digital-to-analog conversion, the following formulas convert the corresponding digital word to the voltage level:

Bipolar:

$$\text{Voltage} = \frac{\text{Digital value} - 2048}{4096} \times \text{F.S.R.}$$

Unipolar:

$$\text{Voltage} = \frac{\text{Digital value}}{4096} \times \text{F.S.R.}$$

Where F.S.R. = Full Scale Range

For example, if the voltage range is ± 5 volts bipolar and the digital value is 3500 (DACH), the corresponding analog voltage is as follows:

$$\text{Voltage} = \frac{3500 - 2048}{4096} \times \text{F.S.R.}$$

$$= \frac{1452}{4096} \times 10$$

$$= 3.5049 \text{ volts}$$

Interface Connector

A 37-pin female D-type connector links the ADC-20 to external devices. The pin assignments are as follows:

+5V	1	20
	2	21
OP3	3	22
OP1	4	23
IP3	5	24
IP1	6	25
DIGITAL GND	7	26
	8	27
D/A CH 0 OUT	9	28
	10	29
	11	30
	12	31
	13	32
	14	33
	15	34
	16	35
	17	36
	18	37
ANALOG GND	19	
		OP2
		OP0
		IP2
		IP0
		D/A CH1 OUT
		ANALOG GND
		ANALOG GND

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ADC 20

Software

The ADC-20 diskette contains an assembly language driver, an installation program, a calibration program, and example programs. The assembly driver is a memory resident file which provides a set of high level functions for communicating with and controlling external devices. Each function is designed for flexibility in software-controlled or interrupt-driven applications. All functions can be called in IBM interpretive BASIC, GWBASIC, TurboBASIC or QuickBASIC. The following is a list of all function calls:

INIT Initializes system & loads interrupt service routine

ENABLE Enables an IRQ level

DISABLE Disables an IRQ level

RDSTAT Reports the current interrupt mask status

TRSM2A Transfers data from memory area to an array

TRSA2M Transfers data from an integer array to a memory area

SETDATARY Sets a data array to store digital values for a specified output channel

D2AMODE Selects 1 of 6 D/A conversion modes:

- software-controlled single conversion;
- externally triggered single conversion; software-controlled one-sweep;
- externally triggered one-sweep;
- externally triggered one-sweep w/one conversion per trigger;
- externally triggered continuous mode

D2AOUTS Performs single D/A conversion for selected channel

D2AOUTM Performs multiple D/A conversion for either or both channels

D2ASTAT Reports D/A conversion status

WRITDO Sends data to digital output port

READDI Reads status from digital input port

RESETIRQ Releases interrupt service routine

Accessories

A. Included with board:

1. D-Connector (loose)
2. Users Manual
3. Floppy disk containing software drivers, auto-calibration programs and sample programs

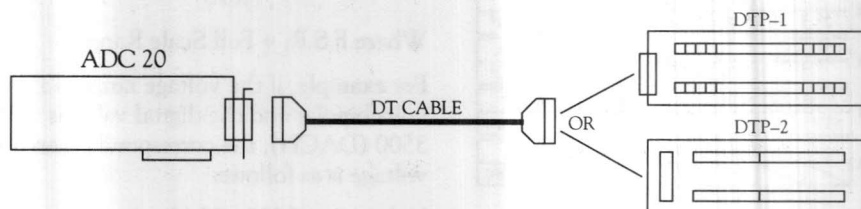
B. Optional – to be ordered extra

1. Termination Panels – DTP-1 or DTP-2 (see page 126)
2. Interconnection cables – D-Cable (see page 127)

Application Software

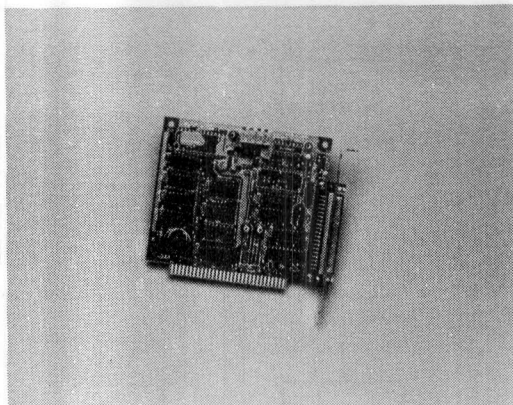
Labtech Notebook	p. 132
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Unkelscope	p. 136
Acquisition Engine	

Product Configuration



ADC 30

Low Cost Analog Input Board



Specifications

■ Analog Input

- Number of channels: 8 single-ended
- Expandable up to 128 channels with multiplexer board ATP-M
- Input ranges:
Bipolar: $\pm 5V$
Unipolar: 0 to 10V
- Absolute Maximum Input Voltage: $\pm 12V$
- Input Impedance:
1 megohm minimum

■ A/D Conversion

- Resolution: 12 bits
- Method: Successive approximation
- Speed: 30,000 samples/sec.
- Conversion Accuracy:
 $\pm 0.04\%$ FSR at 25°C
- Zero Drift: $\pm 40\text{ppm}$ FSR/°C
- Differential Linearity Drift:
 $\pm 3\text{ppm}$ FSR/°C
- Data Code:
Straight binary (unipolar)
Offset binary (bipolar)

■ Digital Input/Output

- Number of Channels:
4 inputs, 4 outputs
- Type: TTL-compatible
- Input Load: 1 LS-TTL load
- Input Logic Level:
Logic 1: 0V – 0.8V
Logic 0: 2.3V – 5.0V
- Output Type: TTL-compatible
- Sink Current: 5V, 8mA
- Fanout Drives: 20 LS-TTL loads
- Output Logic Level:
Logic HI 1: 0V – 0.8V
Logic L0: 2.0V – 5.0V

■ Interrupt Signal Lines

- SIG1: End of conversion
- SIG2: External interrupt

■ Counter

- Number of Counters: 3
- Input Frequencies:
10 MHz (maximum)
- Counter Length: 16 bits
- Counter Type: BCD or binary

Features

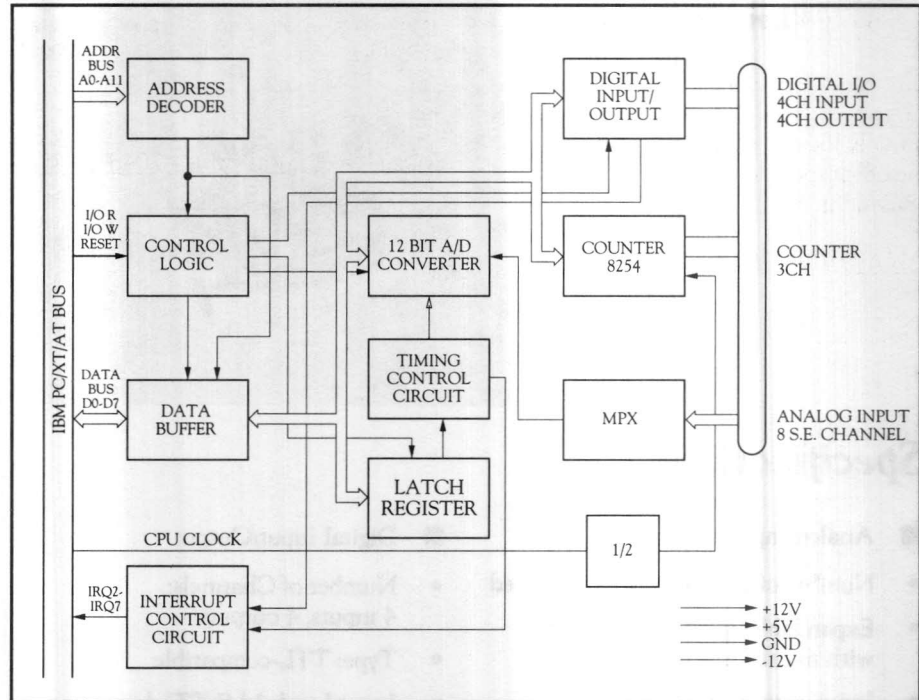
- Plug-in board for IBM PC/XT/AT Bus
- 8 single-ended input channels
- Expandable up to 128 channels with Multiplexer board ATP-M
- Low cost, 12-bit analog-to-digital conversion at speeds up to 30 KHz
- Background and foreground operations
- Programmable timer
- 4 digital input channels
4 digital output channels
- Full interrupt handling capability
- High-level utility and application programs: Labtech Notebook, Labtech Acquire, Labtech Control, Unkelscope

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WARRANTY

ADC 30

Specifications (Continued)

- Address Selection
 - Any 8-byte boundary
- General
 - Occupies one slot on IBM PC/XT/AT bus
 - Power requirements:
 - 250mA at +5V
 - 20mA at +12V
 - 10mA at -12V
 - Operating Temperature:
 - 0 to 50°C
 - Storage Temperature: -40 to 70°C
 - Relative Humidity:
 - 0 to 90% non-condensing
 - Dimensions: 4.2" x 4.7" x 1.0"
 - External Connections:
 - One 37 pin D-connector



Functional Description

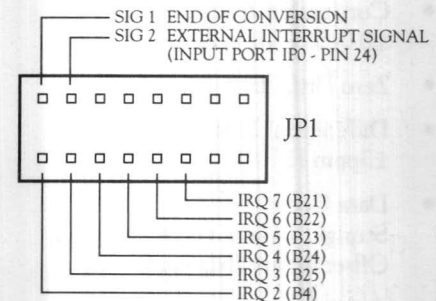
The CONTEC ADC-30 interface board is a plug-in analog-to-digital converter for IBM PC/XT/AT computers. It is designed for applications requiring data acquisition capabilities. The ADC-30 interface board provides eight single-ended input channels, and an industry-standard 12-bit A/D converter (the HADC 6742). The interface board also provides a programmable timer (the i8254), as well as eight digital I/O channels. The base address of I/O port is selected through the use of a DIP-switch. The board occupies eight port addresses for its internal use.

Setting Up Board I/O Address

The base address of the ADC interface board is set with a DIP-switch. This board requires eight consecutive addresses for internal use.

Interrupt Signals

This board generates two interrupt signals, SIG1 and SIG2. SIG1 is the end-of-conversion interrupt, while SIG2 is the external interrupt from input port IP0 pin 24. These signals are sent to the CPU according to jumper settings on JP1.



Input/Output Port

The following tables show port register address assignments. Each register is actually located at the base address plus the offset specified. A slash indicates an unused bit.

READ REGISTER

	D7	D6	D5	D4	D3	D2	D1	D0
+0H	A/D CONVERSION DATA							
	2 ¹¹	2 ¹⁰	2 ⁹	2 ⁸	2 ⁷	2 ⁶	2 ⁵	2 ⁴
+1H	A/D CONVERSION DATA							
	2 ³	2 ²	2 ¹	2 ⁰				
+2H	CONVERSION STATUS				DIGITAL INPUT			
	BUSY				IP3	IP2	IP1	IP0
+4H	COUNTER 0							
	D7	D6	D5	D4	D3	D2	D1	D0
+5H	COUNTER 1							
	D7	D6	D5	D4	D3	D2	D1	D0
+6H	COUNTER 2							
	D7	D6	D5	D4	D3	D2	D1	D0
+7H	CONTROL BYTE							
	SC1	SC2	RL1	RL0	M2	M1	M0	BCD

NOTE: A slash indicates an unused bit.

WRITE REGISTER

	D7	D6	D5	D4	D3	D2	D1	D0
+0H	UNUSED							
+1H	A/D CONVERSION DATA				CHANNEL SELECTION			
	START				C2	C1	C0	
+2H	DIGITAL OUTPUT							
					OP3	OP2	OP1	OP0
+3H	UNUSED							
+4H	COUNTER 0							
	D7	D6	D5	D4	D3	D2	D1	D0
+5H	COUNTER 1							
	D7	D6	D5	D4	D3	D2	D1	D0
+6H	COUNTER 2							
	D7	D6	D5	D4	D3	D2	D1	D0
+7H	CONTROL BYTE							
	SC1	SC2	RL1	RL0	M2	M1	M0	BCD

NOTE: A slash indicates an unused bit.

Data Coding Example

For analog-to-digital and digital-to-analog conversion, the following

formulas convert the corresponding digital word to the voltage level:

Bipolar:

$$\text{Voltage} = \frac{\text{Digital value} - 2048}{4096} \times \text{F.S.R.}$$

Unipolar:

$$\text{Voltage} = \frac{\text{Digital value}}{4096} \times \text{F.S.R.}$$

Where F.S.R. = Full Scale Range

For example, if the voltage range is ± 5 volts bipolar and the digital value is 3500 (DACH), the corresponding analog voltage is as follows:

$$\begin{aligned} \text{Voltage} &= \frac{3500 - 2048}{4096} \times \text{F.S.R.} \\ &= \frac{1452}{4096} \\ &= 3.5049 \text{ volts} \end{aligned}$$

Interface Connector

All analog inputs and digital I/O including the external trigger are connected via a 37-pin D-type female connector. The pin assignments are as follows:

+12V	1	20	-12V
CLK 0	2	21	GATE 0
OUT 0	3	22	GATE 1
CLK 1	4	23	GATE 2
OUT 1	5	24	IP 0
OUT 2	6	25	IP 1
OP 0	7	26	IP 2
OP 1	8	27	IP 3
OP 2	9	28	DIGITAL GND
OP 3	10	29	+5V
	11	30	CH7 HI IN
	12	31	CH6 HI IN
ANALOG	13	32	CH5 HI IN
GND	14	33	CH4 HI IN
	15	34	CH3 HI IN
	16	35	CH2 HI IN
	17	36	CH1 HI IN
	18	37	CH0 HI IN
VREF OUT (+10V)	19		

Software

The assembly driver program included with the ADC-30 interface board provides a set of high-level functions for communicating with and controlling external devices. Each function is designed for flexibility in developing software-controlled or interrupt-driven applications. A/D conversions may be made in single conversion mode or by using multiple scans in any channel sequence. The digital I/O and system functions support a variety of data acquisition system applications. CALL statements in BASIC support all functions. All functions can be CALLED in IBM interpretive BASIC, GWBASIC, Turbo BASIC, or Quik BASIC. The following is a list of all function calls:

INITBRD Initializes the board's base address and interrupt request lines used by the driver
ENABLEIN Enables an IRQ level to accept the external trigger signal.
DISABLEINT Disables an IRQ level to ignore the external interrupt.
INTSTATUS Reports the current status of the 8259 mask register
LOADISR Installs one of the two interrupt service routines: the end-of-conversion interrupt, and the externally triggered A/D conversion
REMOVEISR De-installs one of the two interrupt service routines from the interrupt vector table
TRANSDATA Transfers data from the data buffer defined in the memory area to a BASIC integer array. The data buffer is used for storing the converted data sampled in the background mode
SETCHNL Defines integer array as the channel array which stores the channel numbers to be scanned
SETDATA Declares buffer for storing the converted data

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WARRANTY

ADC 30

Software (Continued)

CHANNELTAG Sets or clears the tag flag that tells the driver whether or not to tag the channel number onto the converted data

A2DSW Initiates N sweeps of analog-to-digital conversions in software-triggered mode

A2DINTF Initiates N sweeps of analog-to-digital conversions made in the foreground hardware-triggered mode

A2DINTB Initiates N sweeps of analog-to-digital conversions in the background hardware-triggered mode

ABORTA2D Abandons the background A/D conversion

WRITEDO Sends digital data to turn the digital channels on or off

READDI Reads the current ON/OFF status from the digital input channels

SETCNTMODE Sets the control word to one of the three counters

LOADCOUNT Loads the starting count to a specified counter

READCOUNT Latches and reports the current count from a specified counter

MEASUREFREQ Measures the frequency of a pulse stream using the on-board timer/counter

MEASUREPULSE Measures the pulse width for a pulse stream

A2DSWMLPX Initiates an analog-to-digital conversion with the use of ATP-M

Application Software

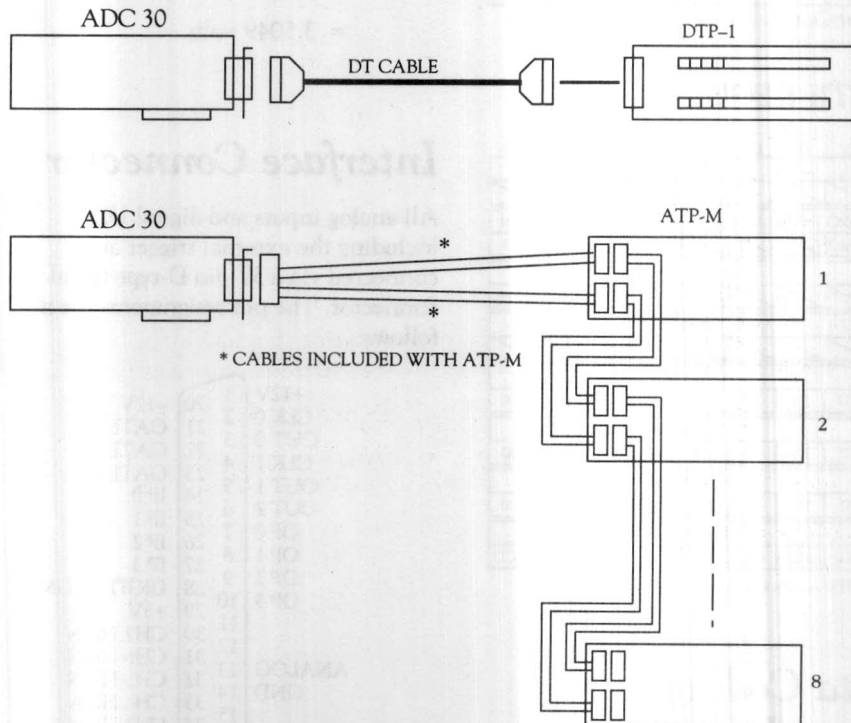
Labtech Notebook	p. 132
Labtech Control	p. 134
Unkelscope	p. 136
Aquisition Engine	

Accessories

- A. Included with board
1. D-Connector (loose)
 2. Users Manual
 3. Floppy disk containing software drivers and sample programs

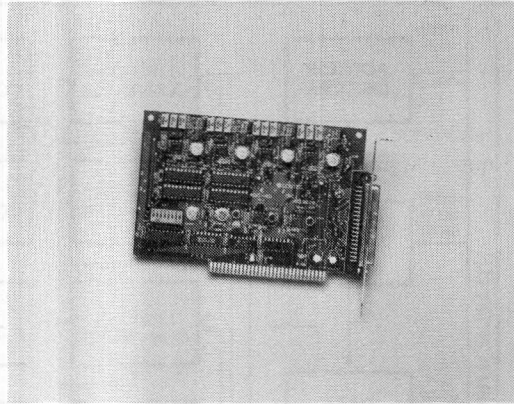
- B. Optional – to be ordered extra
1. Software drivers in C-language
 2. Termination Panels – DTP-1 or DTP-2 (see page 126)
 3. 1080060-ATP-M
Analog terminal panel with multiplexer and signal conditioning for ADC series boards with screw-type terminals. It multiplexes 16 differential input channels into one channel. Up to 8 ATP-M boards can be cascaded.
 4. Interconnection cables – DT- Cable (see page 127)

Product Configuration



ADC 40

4-Channel Analog Output Board



Specifications

- Analog Output
 - Number of Channels: 4
 - Output Ranges:
 - Bipolar: $\pm 5V$, $\pm 10V$
 - Unipolar: 0 – 10V, 0 – 5V
 - Current Loop: 4mA to 20mA
- D/A Conversion
 - 12 bits Resolution
 - Throughput: 30,000 Samples/sec
 - Conversion Accuracy: $\pm 0.05\%$ FSR @ 25°C
 - Conversion Method: Ladder resistor network
 - Slew Rate: 3.5V/microsecond
 - Settling Time to $\pm 1/2$ LSB: 7 micro seconds, 20V step
 - Output Current: $\pm 5mA$
 - Capacitive Drive Capability: 0.5 microfarads
- Data Code:
 - Straight binary (unipolar)
 - Complementary binary (bipolar)
- Thermal Characteristic: ± 50 ppm of FSR /°C.
- Address Selection
 - Any 8-byte boundary
- General
 - Operating Temperature: 0 to 50° C
 - Storage Temperature: -40 to 70°C
 - Relative Humidity: 0 to 90% non-condensing
 - Dimension: 4.2" x 5.9" x 1.0"
 - External connections via: one 37 pin D-connector

Features

- Plug-in board for IBM PC/XT/AT bus
- 12-bit DA with 30,000 samples/sec maximum
- 4 analog output channels
- Voltage or current loop outputs
- High-level utility and application programs:
 - Labtech Notebook, Labtech Acquire, LT/Control, Unkelscope, Acquisition Engine

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WARRANTY

ADC 40

Functional Description

The CONTEC ADC40 interface board is used for digital-to-analog conversion, and fits into the expansion slots of the IBM PC/XT/AT series and compatibles. With this board, the computer can output voltages more quickly and accurately. The ADC40 features four channels of voltage outputs or current-loop outputs using a D/A converter with rapid 12-bit resolution. Drivers are provided with the board for the efficient control and programming of the ADC40.

Data Coding Example

For analog-to-digital and digital-to-analog conversion, the following formulae convert the corresponding digital word to the voltage level:

Bipolar:

$$\text{Voltage} = \frac{\text{Digital value} - 2048}{4096} \times \text{F.S.R.}$$

Unipolar:

$$\text{Voltage} = \frac{\text{Digital value}}{4096} \times \text{F.S.R.}$$

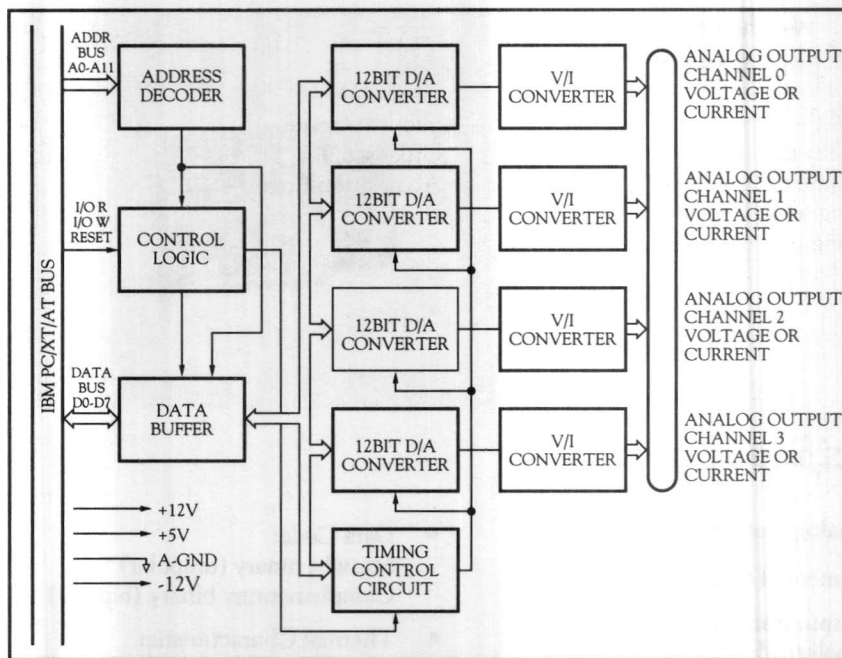
Where F.S.R. = Full Scale Range

For example, if the voltage range is ± 5 volts bipolar and the digital value is 3500 (DACH), the corresponding analog voltage is as follows:

$$\text{Voltage} = \frac{3500 - 2048}{4096} \times \text{F.S.R.}$$

$$= \frac{1452}{4096} \times 10$$

$$= 3.5049 \text{ Volts}$$



Output Port

The ADC40 provides four analog output channels. Each channel occupies two buffer registers; therefore, each channel can be addressed individually. The following tables show register port address assignments. Each register is actually located at the base address plus the offset specified. A slash indicates an unused bit.

	D7	D6	D5	D4	D3	D2	D1	D0
+0H	0CH CONVERSION DATA							
	2 ³	2 ²	2 ¹	2 ⁰				
+1H	0CH D/A CONVERSION DATA							
	2 ¹¹	2 ¹⁰	2 ⁹	2 ⁸	2 ⁷	2 ⁶	2 ⁵	2 ⁴
+2H	1CH CONVERSION DATA							
	2 ³	2 ²	2 ¹	2 ⁰				
+3H	1CH D/A CONVERSION DATA							
	2 ¹¹	2 ¹⁰	2 ⁹	2 ⁸	2 ⁷	2 ⁶	2 ⁵	2 ⁴
+4H	2CH CONVERSION DATA							
	2 ³	2 ²	2 ¹	2 ⁰				
+5H	2CH D/A CONVERSION DATA							
	2 ¹¹	2 ¹⁰	2 ⁹	2 ⁸	2 ⁷	2 ⁶	2 ⁵	2 ⁴
+6H	3CH CONVERSION DATA							
	2 ³	2 ²	2 ¹	2 ⁰				
+7H	3CH D/A CONVERSION DATA							
	2 ¹¹	2 ¹⁰	2 ⁹	2 ⁸	2 ⁷	2 ⁶	2 ⁵	2 ⁴

NOTE: A slash indicates an unused bit.

Setting Up Board I/O Address

The base address of the ADC40 interface board is set with a DIP-switch. This board requires eight I/O consecutive addresses for internal use.

Interface Connector

A 37-pin input/output connector provides the connections between the ADC40 interface board and the appropriate external devices. The operating output range is selected by jumpering pins on the rear connector mating half. The pin assignments are as follows.

1	20	
ANALOG GND	2	21
ANALOG GND	3	22
-10V REF	4	23
-5V REF	5	24
ANALOG GND	6	25
CUN-1 (1CH)	7	26
CUP-1 (1CH)	8	27
ANALOG GND	9	28
ANALOG GND	10	29
ANALOG GND	11	30
-10V REF	12	31
-5V REF	13	32
ANALOG GND	14	33
CUN-3 (3CH)	15	34
CUP-3 (3CH)	16	35
ANALOG GND	17	36
ANALOG GND	18	37
Vcc (+5V)	19	
		BI-0 (0CH)
		UNI-0 (0CH)
		REFI-0 (0CH)
		CUP-0 (0CH)
		CUN-0 (0CH)
		REFI-1 (1CH)
		UNI-1 (1CH)
		BI-1 (1CH)
		UNI-2 (2CH)
		BI-2 (2CH)
		REFI-2 (2CH)
		CUP-2 (2CH)
		CUN-2 (2CH)
		REFI-3 (3CH)
		UNI-3 (3CH)
		BI-3 (3CH)

Accessories

- A. Included with board
 1. D-Connector (loose)
 2. Users Manual
 3. Floppy disk containing software drivers, auto-calibration program and sample programs
- B. Optional
 1. Termination Panels – DTP-1 or DTP-2 (see page 126)
 2. Interconnection cables – DT- Cable (see page 127)

Application Software

Labtech Notebook	p.132
Labtech Control	p.134
Unkelscope	p.136
Acquisition Engine	

Software

The assembly driver program included with the ADC40 interface board provides a set of high-level functions for communicating with and controlling external devices. One of the five board functions is for board selection, and the other four for digital-to-analog conversion. The driver is designed to operate the ADC40 in two modes: single conversion mode and multiple conversion mode. CALL statements in BASIC support all functions. All functions can be CALLED in IBM interpretive BASIC,

GWBASIC, Turbo BASIC or Quik BASIC. The following is a list of all function calls:

INITBRD Reinitializes the board's base address used in the driver program. The driver program may control another ADC40 board by passing its base address to this function.

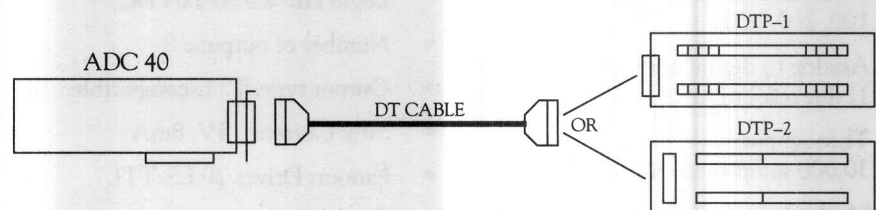
SETCHNLARY Defines an integer array as the channel buffer which stores channel numbers to be scanned. This function is used in the multiple digital-to-analog conversion mode.

SETDATARY Sets a data buffer for each channel to store digital data; the data are the outputs to the corresponding channel. This function is called in the multiple digital-to-analog conversion mode.

D2AOUTM Initiates multiple digital-to-analog conversions by a specified number.

D2AOUTS Initiates a single digital-to-analog conversion for a specified channel.

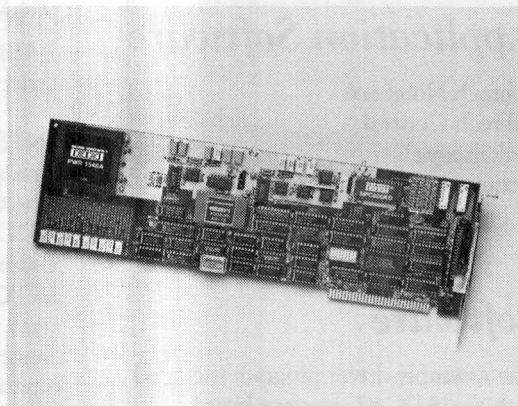
Product Configuration



3-YEAR
WARRANTY

ADC50

Low Cost Programmable-Gain Analog Input Board



Specifications

■ Analog Inputs:

- No. of channels: 16 single-ended or 8 differential
- Bipolar: $\pm 2.5V$, $\pm 5V$, $\pm 10V$
Unipolar: 0 to 5V, 0 to 10V
- Absolute maximum input voltage: $\pm 12V$
- Input impedance: 1 megohm minimum
- Programmable gain:
Software selectable: 1, 2, 10, 20, 100, 200, 1000
- Analog to digital conversion: 12-bit resolution
- Throughput: 30,000 samples/second
- Method: Successive approximation
- Accuracy: $\pm 0.04\%$ of FSR at 25°C
- Zero drift: ± 40 ppm of FSR per °C
- Gain drift: ± 40 ppm of FSR per °C
- Differential linearity drift: ± 3 ppm of FSR per °C

- Data Code:
Straight binary (Unipolar)
Offset binary (Bipolar)

■ Digital Input/Output

- Number of inputs: 8
 - Input type: TTL-compatible
 - Input load:
Presents 1 LS-TTL load
 - Input logic level:
Logic LO: 0.0V to 0.8VDC,
Logic HI: 2.3 to 5.0VDC
 - Number of outputs: 8
 - Output type: TTL-compatible
 - Sink Current: 5V, 8mA
 - Fanout: Drives 20 LS-TTL
 - Output logic level:
Logic LO: 0.0 to 0.8VDC
Logic HI: 2.3 to 5.0VDC
- ### ■ Interrupt:
- End of conversion
 - External Interrupt

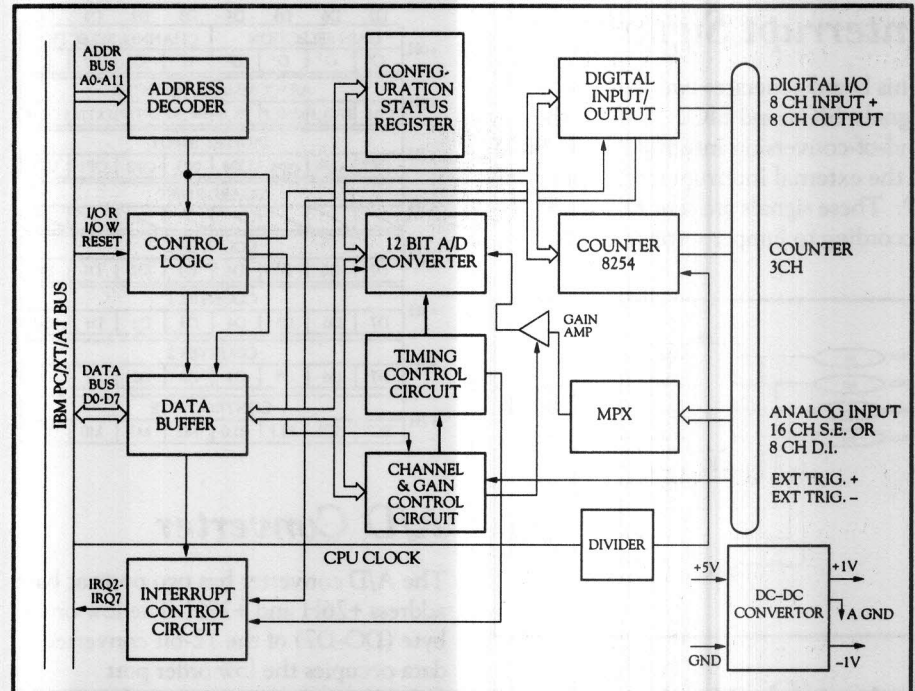
Features

- Plug-in board for IBM PC/XT/AT bus
- 16 single-ended/8 differential analog input channels
- Programmable gain
- Analog to digital conversion: 12-bit resolution, 30,000 samples/second maximum
- 8 digital input and 8 digital output channels
- Full interrupt handling capability for high-speed data acquisition
- Programmable timer/counter
- Background and foreground operations
- Easy-to-use software support with drivers and sample programs
- High-level driver program control of analog to digital conversion

ADC50

Specifications (Continued)

- Counters/Timers
 - No. of counters/timers: 3
 - Input frequency: 10 MHz max.
 - Counter length: 16 bits
 - Counter type: BCD or Binary
- Address Selection
 - Base address: Any 8-byte boundary
 - I/O Port selection: Via on-board DIP switch and jumper
- General
 - Occupies one slot on IBM PC/XT/AT bus
 - Power Consumption
 - +5V, 250mA
 - +12V, 20mA
 - 12V, 10mA
 - Operating temperature range: 0 to 50°C
 - Storage temperature range: -20 to 70°C
 - Relative humidity range: 0 to 90 % (non-condensing)
 - Dimensions: 4.2" x 13.1" x 1.0"
 - External connections via: One 68-pin I/O connector



Functional Description

The Contec ADC 50 interface board is an analog to digital conversion board for IBM PC/XT/AT or compatible computers. It is ideal for low cost analog input and features programmable gain. The ADC 50 interface board has full interrupt handling capability for high-speed data acquisition. When installed in the computer's expansion slots, this full-length board transforms the computer into a high precision data acquisition and signal analysis instrument. The ADC 50 performs the following functions: Programmable gain; it

converts analog signals into 12-bit digital data; it has a built-in multipurpose I/O port; and it has a programmable timer/counter. This board uses industry standard, 12-bit successive approximate converters to convert analog inputs from up to 16 single-ended channels.

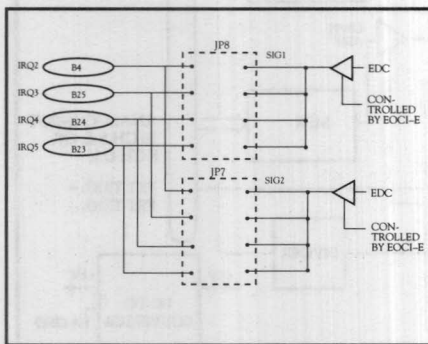
Setting Up I/O Board Address

The base address of the ADC interface board is set with a DIP-switch and jumper. This board requires eight consecutive addresses for internal use.

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Interrupt Signals

This board generates two interrupt signals, SIG1 and SIG2. SIG1 is the end-of-conversion interrupt, while SIG2 is the external interrupt from input port IP. These signals are sent to the CPU according to jumper settings on J1.



Input/Output Registers

The following tables show register port address assignments. Each register is actually located at the base address plus the offset specified. A slash indicates an unused bit.

	D7	D6	D5	D4	D3	D2	D1	D0
+0H	A/D CONVERSION DATA							
	2 ⁷	2 ⁶	2 ⁵	2 ⁴	2 ³	2 ²	2 ¹	2 ⁰
+1H	A/D CONVERSION DATA							
*	BUSY	EOC	0	0	2 ¹	2 ⁰	2 ⁹	2 ⁸
	C ⁴	C ³	C ²	C ¹				
+2H	DIGITAL INPUT							
	IP7	IP6	IP5	IP4	IP3	IP2	IP1	IP0
+3H	CONFIGURATION STATUS							
	D7	D6	D5	D4	D3	D2	D1	D0
+4H	COUNTER 0							
	D7	D6	D5	D4	D3	D2	D1	D0
+5H	COUNTER 1							
	D7	D6	D5	D4	D3	D2	D1	D0
+6H	COUNTER 2							
	D7	D6	D5	D4	D3	D2	D1	D0
+7H	CONTROL BYTE							
	SC1	SC2	RL1	RL0	M2	M1	M0	BCD

* Indicates channel number when EOC interrupt mode was selected.

	D7	D6	D5	D4	D3	D2	D1	D0
+0H	GAIN SELECTION				CHANNEL SELECTION			
	G ⁴	G ³	G ²	G ¹	C ⁴	C ³	C ²	C ¹
+1H	A/D COMMAND REGISTER							
	CAL	TRG_PMSB_P	TR_S	SW_ST	EXTIP	EXTIE	EOC1E	
+2H	DIGITAL INPUT							
	OP7	OP6	OP5	OP4	OP3	OP2	OP1	OP0
+3H	BOARD RESET							
+4H	COUNTER 0							
	D7	D6	D5	D4	D3	D2	D1	D0
+5H	COUNTER 1							
	D7	D6	D5	D4	D3	D2	D1	D0
+6H	COUNTER 2							
	D7	D6	D5	D4	D3	D2	D1	D0
+7H	CONTROL BYTE							
	SC1	SC2	RL1	RL0	M2	M1	M0	BCD

A/D Converter

The A/D converter has two ports at base address +26H and +27H. The low order byte (D0-D7) of the 12-bit converted data occupies the low order port (+26H), while the remaining bits (D8-D11) are in the four least significant positions of the high order port (+27H). The status bit EOC at port (+27H) will be set when an A/D conversion is finished, and reset after the converted data is read. The conversion mode, read mode, channel selection and internal timer setup can be selected by setting the proper bits at these two ports. A slash indicates an unused bit.

	D7	D6	D5	D4	D3	D2	D1	D0
+0H	A/D CONVERSION DATA							
	2 ¹¹	2 ¹⁰	2 ⁹	2 ⁸	2 ⁷	2 ⁶	2 ⁵	2 ⁴
+1H	A/D CONVERSION DATA							
	2 ³	2 ²	2 ¹	2 ⁰				

Data Coding Example

For analog-to-digital conversion the following formula convert the corresponding digital word to the voltage level:

Bipolar:

$$\frac{((4096 - \text{Digital value}) - 2048)}{4096} \times \text{F.S.R.}$$

Unipolar:

$$\frac{(4096 - \text{Digital value})}{4096} \times \text{F.S.R.}$$

F.S.R. = Full Scale Range

For example, if the voltage range is ± 5 volts bipolar and the digital value is 3500 (DACH), the corresponding analog voltage is as follows:

$$\begin{aligned} & \frac{(4096 - 3500) - 2048}{4096} \times \text{F.S.R.} \\ &= \frac{-1452}{4096} \times 10 \\ &= -3.5049 \text{ volts} \end{aligned}$$

Interface Connectors

All analog input and digital I/O ports, including the external trigger, are connected via a 68-pin I/O connector.

* S/E 00 DIFF 00+	L01	○	○	R01	DIGITAL OUT BIT 0
A S/E 08 DIFF 00-	L02	○	○	R02	DIGITAL OUT BIT 1
N S/E 01 DIFF 01+	L03	○	○	R03	DIGITAL OUT BIT 2
A S/E 09 DIFF 01-	L04	○	○	R04	DIGITAL OUT BIT 3
L S/E 02 DIFF 02+	L05	○	○	R05	DIGITAL OUT BIT 4
O S/E 10 DIFF 02-	L06	○	○	R06	DIGITAL OUT BIT 5
G S/E 03 DIFF 03+	L07	○	○	R07	DIGITAL OUT BIT 6
S/E 11 DIFF 03-	L08	○	○	R08	DIGITAL OUT BIT 7
I S/E 04 DIFF 04+	L09	○	○	R09	DIGITAL GROUND
N S/E 12 DIFF 04-	L10	○	○	R10	DIGITAL IN BIT 0
P S/E 05 DIFF 05+	L11	○	○	R11	DIGITAL IN BIT 1
U S/E 13 DIFF 05-	L12	○	○	R12	DIGITAL IN BIT 2
T S/E 06 DIFF 06+	L13	○	○	R13	DIGITAL IN BIT 3
S/E 14 DIFF 06-	L14	○	○	R14	DIGITAL IN BIT 4
S/E 07 DIFF 07+	L15	○	○	R15	DIGITAL IN BIT 5
* S/E 15 DIFF 07-	L16	○	○	R16	DIGITAL IN BIT 6
ANALOG GROUND	L17	○	○	R17	DIGITAL IN BIT 7
	L18	○	○	R18	DIGITAL GROUND
	L19	○	○	R19	TIMER 2 CLOCK IN
	L20	○	○	R20	TIMER 2 GATE IN
	L21	○	○	R21	TIMER 2 OUTPUT
	L22	○	○	R22	TIMER 1 CLOCK IN
	L23	○	○	R23	TIMER 1 GATE IN
	L24	○	○	R24	TIMER 1 OUTPUT
	L25	○	○	R25	
	L26	○	○	R26	TIMER 0 GATE IN
EXT. TRG. N/O	L27	○	○	R27	TIMER 0 OUTPUT
EXT. TRG. N/C	L28	○	○	R28	
DIGITAL GROUND	L29	○	○	R29	DIGITAL GROUND
+5VDC	L30	○	○	R30	+5VDC
	L31	○	○	R31	
	L32	○	○	R32	
DIGITAL GROUND	L33	○	○	R33	DIGITAL GROUND
+5VDC	L34	○	○	R34	+5VDC

ADC50

Programming

The ADC50 interface board is supplied with a driver for IBM BASICA, GWBASIC, Microsoft QuickBASIC, and Microsoft C language. The driver is a memory resident program running under DOS 3.x and latter. The driver provides a set of low-level and high-level functions to communicate and control external devices. User may use low-level functions to gain the most flexibility of controlling the device, or simply choose the high-level functions to reach the highest performance. A/D conversions may be made in foreground or background mode using either the on-board clock or an external clock. The digital I/O functions may be used in many process control applications. A frequency measurement function is designed for counting the external pulse source. All functions are invoked through a single function CALL with appropriate function number. The following is a list of all functions:

FUNCTION# DESCRIPTION

- 0 **Board Initialization**
Initialize the board in a known state.
- 1 **Channel and Gain Selection**
Select channel number and Gain to be scanned.

- 2 **Start Conversion**
Trigger a A/D conversion on the pre-selected channel.
- 3 **Check Busy flag**
Reports the busy flag of current A/D conversion.
- 4 **Read A/D Data**
Read the converted A/D data.
- 5 **Set Counter Mode**
Set up the counter operation mode.
- 6 **Read Counter Mode**
Read back the current counter operation mode.
- 7 **Set Count**
Set the initial count to a selected counter.
- 8 **Read Count**
Read the current count from a selected counter.
- 9 **Set Interrupt Mask**
Set the interrupt mask to enable or disable the interrupt
- 10 **Set Signal's Polarity**
Set polarity of external interrupt signal and external trigger signal.
- 11 **Digital Input**
Read digital status
- 12 **Digital Output**
Turn on/off the digital output lines.
- 13 **Synchronous A/D Conversion**
Issue foreground A/D conversions for a selected number of sweeps using on-board timer or the external clock. On each sweep the A/D conversion may scan a single

channel or a number of channels in any sequence. An option can be chosen to tag the channel number to each A/D data. The function also supports ATP-M2 board, a A/D channel expansion board with programmable gain.

- 14 **Asynchronous A/D Conversion**
Issue background A/D conversions for a selected number of sweeps using on-board timer or the external clock. The foreground program may process the collected data without interference of the A/D operation. On each trigger the A/D conversion scans the entire channel array which may contain a single channel or a number of channels in any sequence. An option can be chosen to tag the channel number to each A/D data. The function also supports ATP-M2 board, a A/D channel expansion board with programmable gain.
- 15 **Stop Asynchronous A/D Conversion**
Stop the background A/D conversion operation unconditionally.
- 16 **Frequency Measurement**
Measure frequency of an unknown pulse stream using on-board counter.
- 17 **Data Transfer**
Transfer data collected in the background A/D operation to user's data array.

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Accessories

A. Included with the board

1. Diskette - with drivers and sample programs
2. Users Manual

B. Optional - to be ordered extra

MT/68-Cable

A 4 foot, flat ribbon cable with 68-pin male I/O connectors at either end.

MT/S-Cable

A 4 foot, twisted pair shielded cable with 68-pin male I/O connectors at either end.

MT/34-Cable

A 4 foot, flat ribbon cable with one 68-pin male I/O connector at one end and two 34-pin D-type male connectors at the other end.

MTP-2

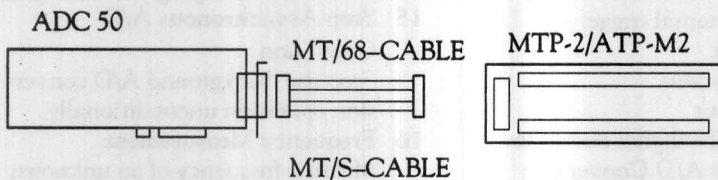
A screw termination panel. it supports 68 screw terminals for field connections and one 68-pin I/O connector for connection to an interface board.

The screw terminals accept 12 - 22 AWG wires.

ATP-M2

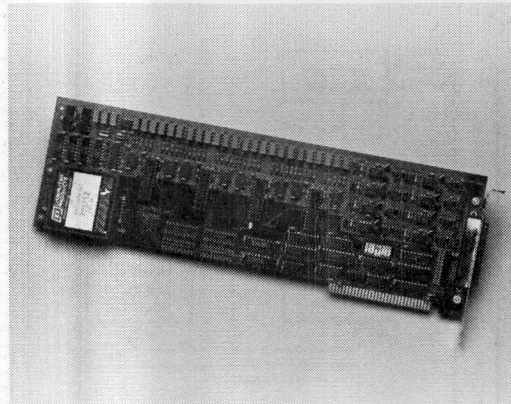
Analog input termination and multiplexer board. Multiplexes 16 differential inputs into one output. Expands input capacities of analog boards. Enables thermocouples to be connected directly for temperature measurement.

Product Configuration



ADC 80

8-Channel Analog Output Board



Specifications

- Analog Outputs
 - No. of channels: 8
 - Output range:
 - Bipolar: $\pm 5V$, $\pm 10V$
 - Unipolar: 0 to 5V, 0 to 10V
 - Current Loop: 4mA to 20mA
 - Output current: $\pm 5mA$
 - Source Impedance:
 - 0.2 ohm max. for 0 to 5V and 0 to 10V
 - 47 ohm max. for $\pm 5V \pm 10V$
 - Capacitive drive capability: 0.5 microfarads
 - Digital to analog conversion: 12-bit conversion
 - Throughput: 30,000 samples/second max.
Method: Ladder resistor network
 - Accuracy: $\pm 0.05\%$ of FSR at 25°C
 - Slew rate: 3.5V/microsecond
 - Thermal Characteristic: ± 50 ppm of FSR/°C
- Settling time to $\pm 1/2$ LSB: 7 microseconds, 20V step
- Data code:
 - Straight binary (Unipolar)
 - Complementary binary (Bipolar)
- Address Selection
 - Base address: Any 32- byte boundary
 - Selection: Via on-board DIP switches
- General
 - Occupies one slot on IBM PC/XT/AT bus
 - Power consumption: +5V, 500mA
 - Operating temperature: 0 to 50°C
 - Storage temperature range: -20 to 60°C
 - Relative humidity: 0 to 90% (non-condensing)
 - Dimensions: 4.2" x 13.1" x 1.0"
 - External Connections: 68-pin I/O connector

Features

- Plug-in board for IBM PC/XT/AT bus
- 8 analog output channels
- 12-bit D/A with 30,000 samples/second max.
- Voltage or current loop operation
- 8 digital input and 8 digital output channels
- Interrupt handling capability
- Foreground/background operation
- Easy-to-use software support with drivers and sample programs

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ADC 80

Functional Description

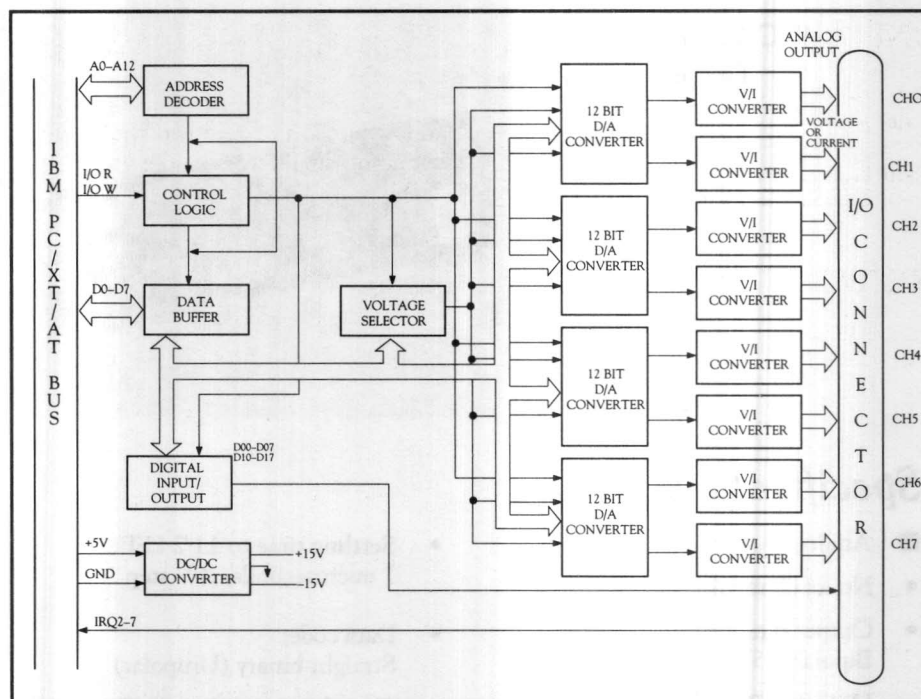
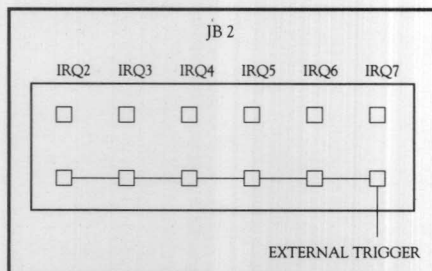
The Contec ADC 80 interface board is used for digital-to-analog conversion and fits into the expansion slots of IBM PC/XT/AT or compatible computers. It offers 8 output channels. The D/A conversion is with 12-bit resolution using a ladder resistive network. The outputs can be either voltages or current loop. Each channel can be configured individually by software. The ADC 80 interface board enables the computer to output voltages more quickly and accurately.

Setting Up I/O Board Address

The base address of the ADC 80 interface board is set with a DIP-switch. This board requires 32 consecutive I/O addresses for internal use.

External Interrupt Signals

This board handles one external interrupt signal from interface connector L21. This signal is sent to the CPU as per jumper setting on JB2.



Output Range Settings

The output range can be set individually for each of the eight channels by software: voltage/level or current loop 4-20mA.

Output Registers

The ADC 80 provides eight analog output channels. Each channel occupies two buffer registers; therefore, each channel can be addressed individually.

Output Port

The following tables show register port address assignments. Each register is actually located at the base address plus the offset specified. A slash indicates and an unused bit.

INPUT PORT

	D7	D6	D5	D4	D3	D2	D1	D0
+10H	ID PORT							
	D7	D6	D5	D4	D3	D2	D1	D0
+11H	DIGITAL INPUT PORT							
	D7	D6	D5	D4	D3	D2	D1	D0

OUTPUT PORT

	D7	D6	D5	D4	D3	D2	D1	D0
+0H	DIGITAL TO ANALOG CH0 LOW BYTE							
	D3	D2	D1	D0				
+1H	DIGITAL TO ANALOG CH0 HIGH BYTE							
	D11	D10	D9	D8	D7	D6	D5	D4
+2H	DIGITAL TO ANALOG CH1 LOW BYTE							
	D3	D2	D1	D0				
+3H	DIGITAL TO ANALOG CH1 HIGH BYTE							
	D11	D10	D9	D8	D7	D6	D5	D4
+4H	DIGITAL TO ANALOG CH2 LOW BYTE							
	D3	D2	D1	D0				
+5H	DIGITAL TO ANALOG CH2 HIGH BYTE							
	D11	D10	D9	D8	D7	D6	D5	D4
+6H	DIGITAL TO ANALOG CH3 LOW BYTE							
	D3	D2	D1	D0				
+7H	DIGITAL TO ANALOG CH3 HIGH BYTE							
	D11	D10	D9	D8	D7	D6	D5	D4
+8H	DIGITAL TO ANALOG CH4 LOW BYTE							
	D3	D2	D1	D0				
+9H	DIGITAL TO ANALOG CH4 HIGH BYTE							
	D11	D10	D9	D8	D7	D6	D5	D4
+AH	DIGITAL TO ANALOG CH5 LOW BYTE							
	D3	D2	D1	D0				
+BH	DIGITAL TO ANALOG CH5 HIGH BYTE							
	D11	D10	D9	D8	D7	D6	D5	D4
+CH	DIGITAL TO ANALOG CH5 HIGH BYTE							
	D3	D2	D1	D0				
+DH	DIGITAL TO ANALOG CH6 HIGH BYTE							
	D11	D10	D9	D8	D7	D6	D5	D4
+EH	DIGITAL TO ANALOG CH7 LOW BYTE							
	D3	D2	D1	D0				
+FH	DIGITAL TO ANALOG CH7 LOW BYTE							
	D11	D10	D9	D8	D7	D6	D5	D4
+10H	DAC VOLTAGE LEVEL REGISTER							
	CH7	CH6	CH5	CH4	CH3	CH2	CH1	CH0
+11H	DIGITAL OUTPUT PORT							
	D7	D6	D5	D4	D3	D2	D1	D0

Data Coding Example

For digital-to-analog conversion, the following formulae convert the corresponding digital word to the voltage level:

Bipolar:

$$\text{Voltage} = \frac{2048 - \text{Digital Value}}{4096} \times \text{F.S.R.}$$

Unipolar:

$$\text{Voltage} = \frac{\text{Digital value}}{4096} \times \text{F.S.R.}$$

Where F.S.R. = Full Scale Range

For example, if the voltage range is ± 5 volts bipolar and the digital value is 3500 (DACH), the corresponding analog voltage is as follows:

$$\begin{aligned} \text{Voltage} &= \frac{2048 - 3500}{4096} \times \text{F.S.R.} \\ &= \frac{-1452}{4096} \times 10 \\ &= -3.5049 \text{ volts} \end{aligned}$$

Interface Connectors

A 68-pin input/output connector provides the connections between the ADC 80 interface board and the appropriate external devices.

L SIDE	PIN NO.	DESCRIPTION	R SIDE	PIN NO.	DESCRIPTION
1	1	Bipolar CH0	1	35	Bipolar CH4
2	2	ANALOG GND	2	36	ANALOG GND
3	3	Unipolar CH0	3	37	Unipolar CH4
4	4	CURRENT (+) CH0	4	38	Current (+) CH4
5	5	CURRENT (-) CH0	5	39	Current (-) CH4
6	6	Bipolar CH2	6	40	Bipolar CH5
7	7	ANALOG GND	7	41	ANALOG GND
8	8	Unipolar CH1	8	42	Unipolar CH5
9	9	Current (+) CH1	9	43	Current (+) CH5
10	10	Current (-) CH1	10	44	Current (-) CH5
11	11	Bipolar CH2	11	45	Bipolar CH6
12	12	ANALOG GND	12	46	ANALOG GND
13	13	Unipolar CH2	13	47	Unipolar CH6
14	14	Current (+) CH2	14	48	Current (+) CH6
15	15	Current (-) CH2	15	49	Current (-) CH6
16	16	Bipolar CH3	16	50	Bipolar CH7
17	17	ANALOG GND	17	51	ANALOG GND
18	18	Unipolar CH3	18	52	Unipolar CH7
19	19	Current (+) CH3	19	53	Current (+) CH7
20	20	Current (-) CH3	20	54	Current (-) CH7
21	21	IRQ	21	55	STROBE
22	22	+5V	22	56	DIGITAL GND
23	23	D_IN_0	23	57	D_OUT_0
24	24	D_IN_1	24	58	D_OUT_1
25	25	D_IN_2	25	59	D_OUT_2
26	26	D_IN_3	26	60	D_OUT_3
27	27	D_IN_4	27	61	D_OUT_4
28	28	D_IN_5	28	62	D_OUT_5
29	29	D_IN_6	29	63	D_OUT_6
30	30	D_IN_7	30	64	D_OUT_7
31	31		31	65	
32	32		32	66	
33	33		33	67	
34	34		34	68	

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ADC 80

Software

The driver program included with the ADC 80 interface board provides a set of high-level functions for communicating with and controlling external devices. The driver is designed to operate the ADC 80 in two modes: single conversion mode and multiple conversion mode. The driver program supports IBM-interpretive BASIC, Quick-BASIC and MS-C. The following is a list of all function calls:

FUNCTION LIST OF ADC80 DRIVER

Function Name	Description
---------------	-------------

init_brd	Initialize the board
-----------------	----------------------

sgle_cov	A single digital to analog conversion for specified channel.
-----------------	--

out_do	Set the digital value to output port.
---------------	---------------------------------------

in_di	Read the digital value from input port.
--------------	---

syn_d2a	Foreground multisweep digital to analog conversion. The driver will not return to application program until conversions are finished.
----------------	---

asyn_d2a	Background multi sweep digital to analog conversion using external trigger. The driver returns to application program as soon as all information is passed.
-----------------	---

reset_asyn	Reset the background multi sweep digital to analog conversion in progress.
-------------------	--

Accessories

A. Included with the board

1. Users Manual
2. Floppy disk containing software drivers and sample programs

B. Optional – to be ordered extra.

MT/68-Cable

A 4 foot, flat ribbon cable with 68-pin male I/O connectors at either end.

MT/S Cable

A 4 foot twisted pair shielded cable with 68-pin male I/O connectors at either end.

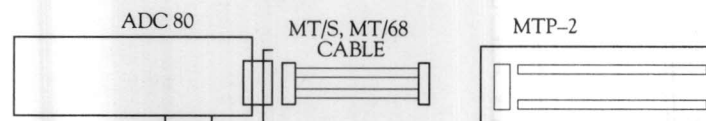
MT/34-Cable

A 4 foot, flat ribbon cable with one 68-pin male I/O connector at one end and two 37-pin D-type male connectors at the other end.

MTP-2

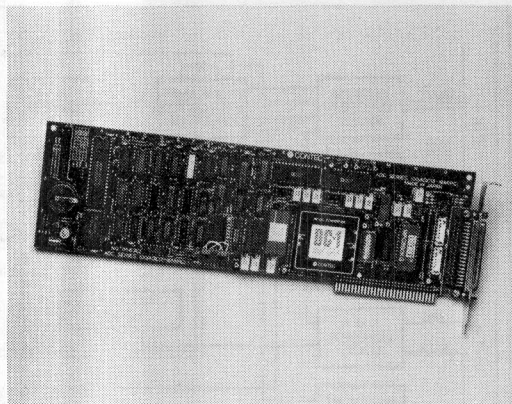
A screw termination panel. It supports 68 screw terminals for field connections and one 68-pin I/O connector for connection to an interface board. The screw terminals accept 12 – 22 AWG wires.

Product Configuration



ADC-100 Series

**Multifunction
A/D, D/A, DIO Boards
ADC-100, ADC-200
ADC-300**



Specifications

■ Input

- Analog Input:
16 Single ended/8 Differential channels
- Full Scale Input Range:
Bipolar $\pm 5V$, $\pm 10V$;
Unipolar 0 – 10V;
Current loop (ADC-200 only)
4..20mA
- Absolute maximum input voltage
 $\pm 30V$
- Input impedance: > 1 megohm
- Programmable gain (ADC-300 only): 1, 10, 100, 200
- A/D Conversion:
successive approximation, 12-bit resolution, throughput 50,000 samples/second
- Accuracy: $\pm 0.04\%$ of FSR at 25°C
- Zero drift: ± 20 ppm of FSR per °C
- Gain Drift: ± 50 ppm of FSR per °C
- Differential Linearity Drift:
 ± 3 ppm of FSR per °C

■ Output

- Analog outputs: 2
- Output Range:
Bipolar $\pm 2.5V$, $\pm 5V$, $\pm 10V$,
Unipolar 0 to 5V, 0 to 10V
Current loop (ADC-200 only)
4..20mA
- Output current: ± 5 mA
- Output impedance (DC):
0.2 ohm max.
- Capacitive drive capability:
0.5 microfarad
- D/A conversion:
ladder resistor network, 12-bit resolution, throughput 30,000 samples/second
- Accuracy: $\pm 0.05\%$ of FSR at 25°C
- Slew Rate: 10V/microsecond
- Settling Time to 1/2 LSB:
4 microsecond, 20V step

Features:

ADC-100

- Plug-in board for IBM PC/XT/AT Bus
- 16 single-ended/8 differential analog input channels
- 12-bit A/D, 50,000 samples/sec. with DMA
- 2 analog output channels, 12-bit D/A, 30,000 samples/sec.
- 24 programmable digital I/O
- Interrupt handling
- Programmable scan rate
- Foreground/background operation
- Easy-to-use software support with sample program
- High-level utility program support: Labtech Notebook, Labtech Acquire, Labtech Control, OnSpec, UnkelScope, SnapShot, Module-PAC, Acquisition Engine
- Real time clock/calendar with battery back-up

ADC-200 (ADC-100 plus)

- Analog inputs/outputs can be operated in current loop mode

ADC-300 (ADC-100 plus)

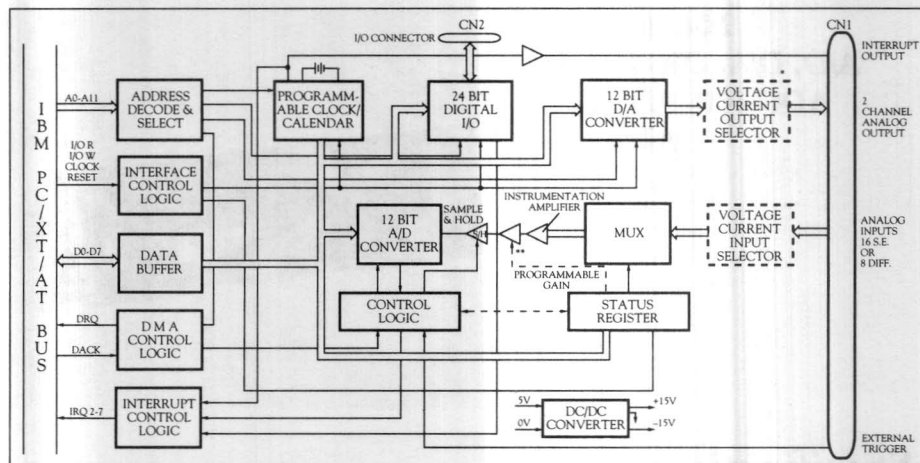
- Programmable voltage gain selection

3-YEAR
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ADC-100 Series

Specifications (Continued)

- **Interrupt Signals**
 - End of conversion
 - Clock/calendar
 - External interrupt
- **Address Selection**
 - Any 64 consecutive addresses
- **General**
 - Occupies one slot on IBM PC/XT/AT bus
 - Real time clock with battery back-up
 - Power requirements: 5 VDC, 1.5 A
 - Operating Temperature: 0 to 50°C
 - Storage Temperature: (-20) to +70°C
 - Relative humidity: 0 to 90%, non condensing
 - Size: 4.2" x 13.1" x 1.0"
 - External Connections via: 1x 37-pin D-connector, 1x 30-pin header connector



* ADC-200 ONLY
** ADC-300 ONLY

Functional Description

The CONTEC ADC-100, ADC-200 and ADC-300 are plug-in, high-speed interface boards for IBM PC/XT/AT computers. They are ideal for laboratory and industrial data acquisition and control applications that require a mix of analog and digital inputs and outputs. The boards provide 16 single ended or 8 differential analog input channels, two analog output channels, 24 digital input/output channels, and a battery backed clock/calendar for real time applications. In addition, provision is made for transferring high speed data through the use of Direct Memory Access (DMA). External connections to the board are via a 37-pin D-connector, CN1, which carries the analog input/output signals and a 30-pin header connector CN2, which carries the digital I/O lines. The analog signals are fed via a software controlled multiplexer to an instrumentation grade amplifier. The amplified

signal is then fed via a sample and hold circuit to the Analog/Digital Converter, which has a 12-bit resolution. The digitized data can then be processed by the personal computer.

In case of ADC-300, a programmable gain amplifier is provided. Gain of 1, 10, 100 or 200 is software selectable.

The A/D conversion can be initiated by software, by the internal timer, by an external trigger or by a combination of the internal timer and the external trigger. The converted data can be collected through a software command, an interrupt service routine or the use of one of the two DMA channels. Software also provides convenient high level commands for D/A conversion, digital input/output and time dependent functions.

In case of ADC-200, additional I/V and V/I circuits are provided in the analog input and output stages, to enable operation with current loop, 4..20mA. Power for the board is drawn from the PC (+5V). An on-board DC/DC converter provides the necessary ± 15 V.

Setting Up I/O Board Address

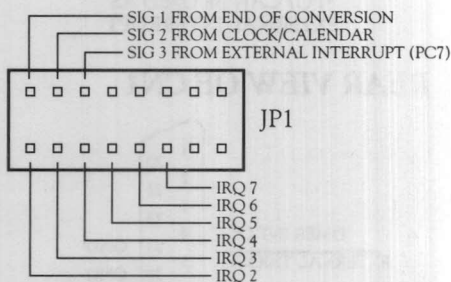
These boards require 64 consecutive addresses. The Base address can be set using DIP-switches. (Note: Some addresses are reserved for the IBM-PC and other boards.)

Input/Output Range Settings

The range settings required for inputs and outputs are made via jumpers on the board, e.g. Single-ended/Differential, Unipolar/Bipolar, Voltage/Current, and Range.

Interrupt Signals

The board generates three interrupt signals. These signals are sent to the CPU according to the jumper settings on JP1 as shown in the diagram:



Input/Output Registers

The following tables show port address assignments for registers on these boards. Note: the actual location of each register is at the selected base address

plus the offset specified. The programmable digital I/O ports as well as most of the clock/calendar ports are bidirectional. A slash indicates an unused bit.

CLOCK/CALENDAR

	D7	D6	D5	D4	D3	D2	D1	D0
+ 0H	1/1000 SECOND COUNTER							
	S8/1000	S4/1000	S2/1000	S1/1000				
+ 1H	1/100 AND 1/10 SECOND COUNTER							
	S8/10	S4/10	S2/10	S1/10	S8/100	S4/100	S2/100	S1/100
+ 2H	SECOND COUNTER							
	/	S40	S20	S10	/	S8	S4	S2
+ 3H	MINUTE COUNTER							
	/	M40	M20	M10	M8	M4	M2	M1
+ 4H	HOUR COUNTER							
	/	H20	H10	H8	H4	H2	H1	
+ 5H	DAY OF THE WEEK COUNTER							
	/	/	/	/	/	W4	W2	W1
+ 6H	DAY OF THE MONTH COUNTER							
	/	/	/	D20	D10	D8	D4	D2
+ 7H	MONTH COUNTER							
	/	/	/	MO10	MO8	MO4	MO2	MO1
+ 8H	RAM 1/1000 SECOND							
	S8/1000	S4/1000	S2/1000	S1/1000	/	/	/	/
+ 9H	RAM 1/100 AND 1/10 SECOND							
	S8/10	S4/10	S2/10	S1/10	S8/100	S4/100	S2/100	S1/100
+ AH	RAM SECOND							
	/	S40	S20	S10	S8	S4	S2	S1
+ BH	RAM MINUTE							
	/	M40	M20	M10	M8	M4	M2	M1
+ CH	RAM HOUR							
	/	/	H20	H10	H8	H4	H2	H1
+ DH	RAM DAY OF THE WEEK							
	/	/	/	/	/	W4	W2	W1
+ EH	RAM DAY OF THE MONTH							
	/	/	/	D80	D40	D20	D10	D8
+ FH	RAM MONTH							
	/	MO80	MO40	MO20	MO10	MO8	MO4	MO2
+ 10H	INTERRUPT STATUS REGISTER (READ ONLY)							
	ST7	ST6	ST5	ST4	ST3	ST2	ST1	ST0
+ 11H	INTERRUPT CONTROL REGISTER (WRITE ONLY)							
	IC7	IC6	IC5	IC4	IC3	IC2	IC1	IC0
+ 12H	COUNTER RESET (WRITE ONLY)							
	CR7	CR6	CR5	CR4	CR3	CR2	CR1	CR0
+ 13H	RAM RESET (WRITE ONLY)							
	PR7	PR6	PR5	PR4	PR3	PR2	PR1	PR0
+ 14H	ROLL-OVER STATUS (READ ONLY)							
	/	/	/	/	/	/	/	/
+ 15H	TIME ADJUSTING (WRITE ONLY)							
	CAN BE ANY DATA							

A/D Converter

The A/D converter has two ports at base address +26H and +27H. The low order byte (D0-D7) of the 12-bit converted data occupies the low order port (+26H), while the remaining bits (D8-D11) are in the four least significant positions of the high order port (+27H). The status bit EOC at port (+27H) will be set when an A/D conversion is finished, and reset after the converted data is read. The conversion mode, read mode, channel selection and internal timer setup can be selected by setting the proper bits at these two ports.

A/D CONVERTER

■ READ REGISTER	
+26H	CONVERSION DATA
	D7 D6 D5 D4 D3 D2 D1 D0
+27H	STATUS CONVERSION DATA
	BUSY EOC TIMER START D11 D10 D9 D8
■ WRITE REGISTER	
+26H	START DMA3 DMA1 CHANNEL SELECT
	ENABLE ENABLE ENABLE C3 C2 C1 C0
+27H	MODE SELECT TIMER SELECT
	ET1 ET0 T5 T4 T3 T2 T1 T0

D/A CONVERTER

■ WRITE REGISTER	
+24H	LOW BYTE
	D7 D6 D5 D4 D3 D2 D1 D0
+25H	GAIN CHANNEL UPPER NIBBLE BYTE
	G1 G0 CS1 CS0 D11 D10 D9 D8

PROGRAMMABLE DIGITAL I/O

+20H	PORT A OF 8255
	PA7 PA6 PA5 PA4 PA3 PA2 PA1 PA0
+21H	PORT B OF 8255
	PB7 PB6 PB5 PB4 PB3 PB2 PB1 PB0
+22H	PORT C OF 8255
	PC7 PC6 PC5 PC4 PC3 PC2 PC1 PC0
+23H	CONTROL WORD OF 8255 (WRITE ONLY)
	CW7 CW6 CW5 CW4 CW3 CW2 CW1 CW0

ADC-100 Series

D/A Converter

The D/A converter occupies two ports at base address +24H and +25H. The low order byte of output data must be sent to the low order port, and the upper 4 bits to the four least significant positions of the port (+25H). CS0 and CS1 are the output channel selection bits.

Gain Selection

(ADC-300 Only)

The G1 and G2 bits are used to select the gain. The following table shows the bit combinations and corresponding gain factors:

G1	G0	GAIN
0	0	1
0	1	10
1	0	100
1	1	200

Operation Mode Selection

The mode selection can be made by setting ET1 and ET0 bits in the mode register (base address +27H). The bit combinations are shown in the following table:

D7 ET1	D6 ET0	MODE	DESCRIPTION
0	0	0	CONVERSION INITIATED THROUGH THE SOFTWARE
0	1	1	CONVERSION INITIATED BY THE INTERNAL TIMER
1	0	2	CONVERSION INITIATED BY AN EXTERNAL TRIGGER
1	1	3	CONVERSION INITIATED BY THE INTERNAL TIMER WHICH IS CONTROLLED BY AN EXTERNAL TRIGGER

Data Coding Example

For analog-to-digital and digital-to-analog conversion, the following formulas convert the corresponding digital word to the voltage level:

Bipolar:

$$\text{Voltage} = \frac{\text{Digital value} - 2048}{4096} \times \text{F.S.R.}$$

Unipolar:

$$\text{Voltage} = \frac{\text{Digital value}}{4096} \times \text{F.S.R.}$$

Where F.S.R. = Full Scale Range

For example, if the voltage range is ± 5 volts bipolar and the digital value is 3500 (DACH), the corresponding analog voltage is as follows:

$$\text{Voltage} = \frac{3500 - 2048}{4096} \times \text{F.S.R.}$$

$$= \frac{1452}{4096} \times 10$$

$$= 3.5049 \text{ Volts}$$

Interface Signal and Pin Assignment

The connections between the ADC interface board and external devices are made by two connectors on the board: CN1, a 37-pin analog input/output connector; and CN2, a 30-pin digital input/output connector.

TOP VIEW OF CN2

	A	B	
{	PA0	1	PB0
	PA1	2	PB1
	PA2	3	PB2
	PA3	4	PB3
	PA4	5	PB4
	PA5	6	PB5
	PA6	7	PB6
	PA7	8	PB7
{	GND	9	GND
	PC0	10	PC4
	PC1	11	PC5
	PC2	12	PC6
	PC3	13	PC7 *
	GND	14	GND
		15	

*PC7 CAN BE USED AS EXTERNAL INTERRUPT

REAR VIEW OF CN1

1	20	
2	21	
3	22	
4	23	GND
5	24	GND
6	25	
7	26	
8	27	D/A 1 OUT
9	28	L.L. GND
10	29	L.L. GND
11	30	CH7 HI IN
12	31	CH6 HI IN
13	32	CH5 HI IN
14	33	CH4 HI IN
15	34	CH3 HI IN
16	35	CH2 HI IN
17	36	CH1 HI IN
18	37	CH0 HI IN
19		L.L. GND

*ALTERNATIVE CONNECTIONS APPLY IN 16 CHANNEL, SINGLE ENDED INPUT CONFIGURATION

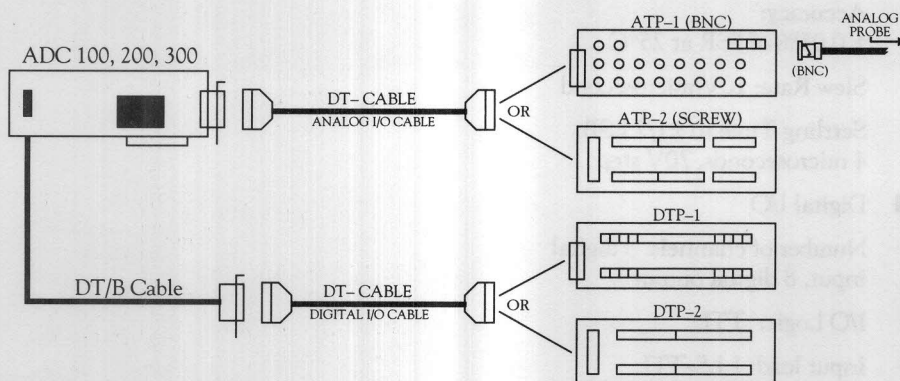
Software

The drivers supplied with the boards provide a comprehensive set of high level functions for communicating with and controlling devices without the need for custom assembly language program interfaces. The functions are divided into four classes, each distinguished by the type of applications served by its functions. The function classes are: precision timing, analog input, analog output and digital input/output:

Precision Timing

ALRMMODE: Select Alarm Mode
ALRMSTAT: Read Interrupt Status
GETRAM: Read RAM Data
GETTIME: Read Real Time Clock
RSTALRM: Reset Ram Registers
RSTTIME: Reset Real Time Clock
SETALRM: Set RAM Registers
SETTIME: Set Real Time Clock
SPRD: Set Internal Timer Period

Product Configuration



Analog Input

A2DCHNL: Select A/D Input Channel
A2DIN: Read A/D Input Data
A2DMODE: Select Read Mode
CNVMODE: Select Conversion Mode
GOCNVR: Start A/D Conversion
SETGAIN: Select Gain Factor (ADC-300 only)

Analog Output

D2AOUT: Initiate D/A Conversion Mode

Digital Input/Output

DIOINIT: Select Digital I/O Port Configurations
DIOINP: Get Data From Digital Input Port
DIOOUT: Send Data to Digital Output Port
INIT: Initialize Systems

Accessories

A. Included with the board

1. D-connector (loose)
2. DT/B cable
3. Users manual
4. Floppy disk containing software drivers and sample programs

B. Optional – to be ordered extra

1. Software drivers in C-language
2. Terminations panels ATP-1, ATP-2, DTP-1, DTP-2 (see page 126)
3. Interconnection cables DT-Cable (see page 127)

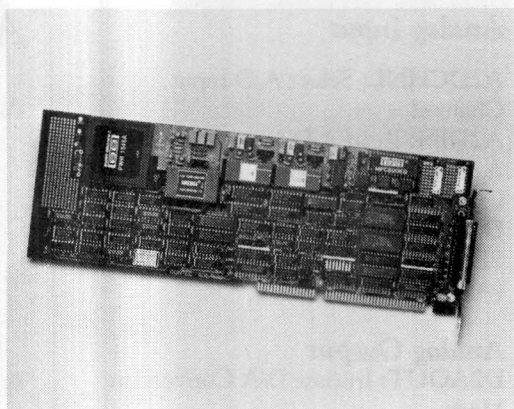
Application Software

Labtech Notebook	p. 132
Labtech Control	p. 134
Unklescope	p. 136
Snapshot	p. 138
Module-PAC	p. 145
Acquisition Engine	
Onspec	

3-YEAR
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ADC 400

High Speed Multifunction Board



Specifications

■ Inputs

- Analog inputs: 16 single-ended or 8 differential
- Full Scale Input Range:
Bipolar $\pm 10V$; $\pm 5V$; $\pm 2.5V$
Unipolar 0–5V, 0–10V
- Absolute maximum input voltage:
 $\pm 30V$
- Input impedance: > 1 megohm
- A/D Conversion: 12-bit resolution,
throughput 100,000 samples/second
using DMA, successive
approximation
- DMA: Software Selectable,
Channel 5 or 6
- Accuracy: 0.05% FSR @ 25°C
- Zero Drift: ± 20 ppm of FSR per °C
- Gain Drift: ± 50 ppm FSR per °C
- Differential Linearity Drift: 13 ppm
FSR per °C
- Programmable Scan Rate:
20 microseconds to 1 year
- Programmable Scan Sequence

■ Output:

- Analog outputs: 2

• Full Scale Output Range:

Bipolar $\pm 2.5 V$, $\pm 5V$, $\pm 10V$
Unipolar 0–5V; 0–10V

- Output current: ± 5 mA
- Output impedance (DC):
0.2 ohm max.
- Capacitive drive capability:
0.5 microfarad
- D/A conversion:
ladder resistor network, 12-bit
resolution, throughput 50,000
samples/second
- Accuracy:
 $\pm 0.05\%$ of FSR at 25°C
- Slew Rate: 10V/microsecond
- Settling Time to $\pm 1/2$ LSB:
4 microseconds, 20V step

■ Digital I/O

- Number of channels: 8 digital
input, 8 digital output
- I/O Logic: TTL
- Input load: 1 LS-TTL
- Input logic level:
Logic LO: 0.0 to 0.8VDC, sink
1.7mA

Features

- Plug-in board for IBM PC/AT bus
- 16 single-ended/8 differential analog
input channels
- 12-bit A/D, 100,000 samples/second
using DMA
- 2 analog output channels, 12-bit D/A,
50,000 samples/second
- Digital I/O, 8 inputs and 8 outputs
- Interrupt handling
- Programmable timer
- Programmable scan rate,
20 microseconds to 1 year
- Programmable scan sequence
- Foreground/background operation
- Easy-to-use software support with
drivers and sample programs

Specifications (Continued)

Logic HI: 2.3 to 5.0VDC

- Fan out: 20 LS-TTL
- Output logic level:
Logic LO: 0.0 to 8VDC, sink
1.7mA

Logic HI: 2.0 to 5.0VDC

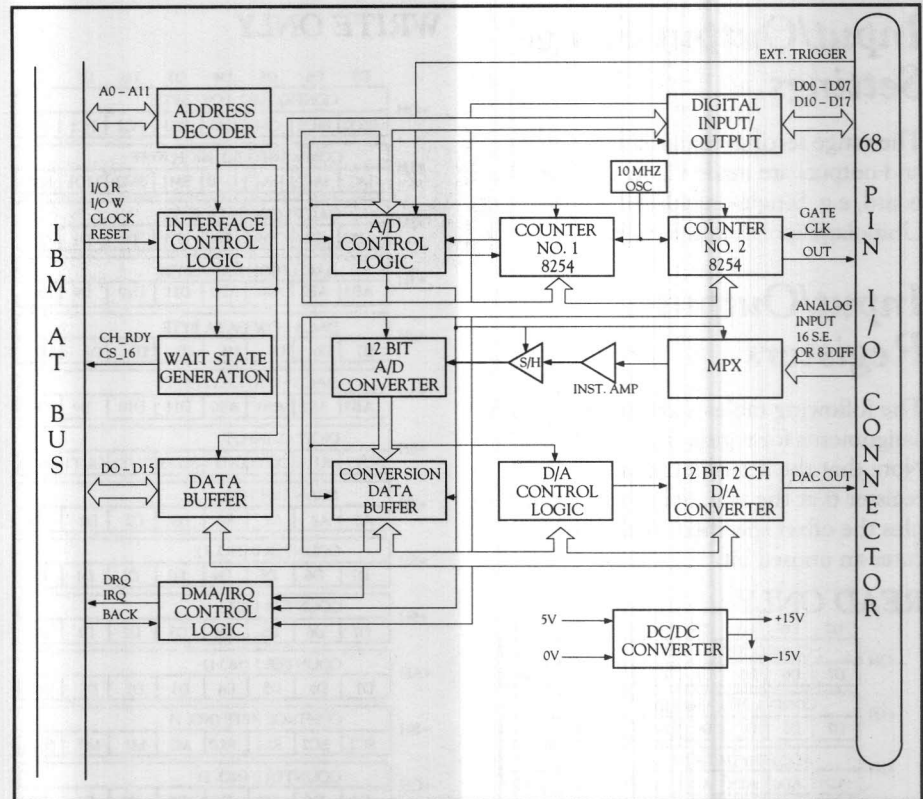
- **Timer/Counter**
 - Number of channels: 3, 16-bit
 - Number of counters: 2
 - Input frequency: DC to 10.0 MHz
 - Number of timers: 1
 - Signals: TTL-level
 - Settings: 16-bit (BCD or binary)

- **Interrupt Signals**
 - Number of interrupts: 3
 - Types of signals:
End of conversion, end of DMA
Transfer, external interrupt

- **Address Selection**
 - Any 16 consecutive addresses. Base
address can be set using DIP
switches.

- **General**
 - Occupies one slot on IBM PC/AT
bus
 - Power requirements: 5 VDC, 1.5A
 - Operating temperature range:
0 to 50°C

- **Storage temperature range:**
-20 to 70°C
- Relative humidity: 0 to 90%
non-condensing
- Dimensions: 4.2" x 13.1" x 1.0"
- External connections via:
One 68-pin I/O-connector



Functional Description

The ADC-400 is a high speed analog/digital I/O multifunction board for IBM PC/AT computers. It is ideal for laboratory and industrial data acquisition and control applications that require a mix of analog and digital inputs and outputs. The board provides 16 single-ended or 8 differential input channels, 2 analog output channels, 8 digital input and 8 digital output channels, and 3 channels for timer/counter functions. In addition, provision is made for transferring high speed data from selective or all channels through the use of Direct Memory Access (DMA). The 12-bit A/D

conversion can be initiated by software, by the internal timer, by an external trigger, or by a combination of the internal timer and an external trigger. The converted data may be collected through the software command, an interrupt service routine, or the use of one of the two DMA channels. Software also provides convenient high level commands for A/D or D/A conversion, and digital input/output.

Setting Up I/O Board Address

This board requires 16 consecutive addresses. The base address can be set using DIP switches.

3-YEAR
WARRANTY

ADC 400

Input/Output Range Settings

The range settings required for inputs and outputs are made via jumpers on the board, e.g. Single-ended/Differential, Unipolar/Bipolar, and Range.

Input/Output Registers

The following tables show port address assignments for registers on this board. Note that the actual location of each register is at the selected base address plus the offset specified. A slash indicates an unused bit.

READ ONLY

	D7	D6	D5	D4	D3	D2	D1	D0
+OH	CONFIG. REG. LOW BYTE							
	D7	D6	D5	D4	D3	D2	D1	D0
+1H	CONFIG. REG. HIGH BYTE							
	D7	D6	D5	D4	D3	D2	D1	D0
+2H	ADC LOW DATA BYTE							
	AD7	AD6	AD5	AD4	AD3	AD2	AD1	AD0
+3H	ADC HIGH DATA BYTE							
	LC3	LC2	LC1	LC0	AD11	AD10	AD9	AD8
+4H	ENDS SCAN IN PROGRESS							
+5H	RESETS INTERRUPT LATCH							
+6H	DIGITAL INPUT							
	IN7	IN6	IN5	IN4	IN3	IN2	IN1	IN0
+7H	POWER ON RESET							
+8H	COUNTER 0 (NO. 1)							
	D7	D6	D5	D4	D3	D2	D1	D0
+9H	COUNTER 1 (NO. 1)							
	D7	D6	D5	D4	D3	D2	D1	D0
+AH	COUNTER 2 (NO.1)							
	D7	D6	D5	D4	D3	D2	D1	D0
+BH								
+CH	COUNTER 0 (NO. 2)							
	D7	D6	D5	D4	D3	D2	D1	D0
+DH	COUNTER 1 (NO. 2)							
	D7	D6	D5	D4	D3	D2	D1	D0
+EH	COUNTER 2 (NO. 2)							
	D7	D6	D5	D4	D3	D2	D1	D0
+FH								

WRITE ONLY

	D7	D6	D5	D4	D3	D2	D1	D0
+OH	CONFIG. REG. LOW BYTE							
	IRQ2	IRQ1	CM	OM	PC3	PC2	PC1	PC0
+1H	COMMAND REG. HIGH BYTE							
	IA1	IA0	DA1	DA0	SM1	SM0	MD1	MD0
+2H	DAC 0 LOW DATA BYTE							
	D7	D6	D5	D4	D3	D2	D1	D0
+3H	DAC 1 HIGH DATA BYTE							
	AB3	AB2	AB1	AB0	D11	D10	D9	D8
+4H	DAC 1 LOW DATA BYTE							
	D7	D6	D5	D4	D3	D2	D1	D0
+5H	DAC 1 HIGH DATA BYTE							
	AB3	AB2	AB1	AB0	D11	D10	D9	D8
+6H	DIGITAL INPUT							
	OUT7	OUT6	OUT5	OUT4	OUT3	OUT2	OUT1	OUT0
+7H	SCAN LIST REG.							
	A3	A2	A1	A0	D3	D2	D1	D0
+8H	COUNTER 0 (NO. 1)							
	D7	D6	D5	D4	D3	D2	D1	D0
+9H	COUNTER 1 (NO. 1)							
	D7	D6	D5	D4	D3	D2	D1	D0
+AH	COUNTER 2 (NO.1)							
	D7	D6	D5	D4	D3	D2	D1	D0
+BH	CONTROL BYTE (NO. 1)							
	SC1	SC2	RL1	RL0	M2	M1	M0	BCD
+CH	COUNTER 0 (NO. 1)							
	D7	D6	D5	D4	D3	D2	D1	D0
+DH	COUNTER 1 (NO. 2)							
	D7	D6	D5	D4	D3	D2	D1	D0
+EH	COUNTER 2 (NO. 2)							
	D7	D6	D5	D4	D3	D2	D1	D0
+FH	CONTROL BYTE (NO. 2)							
	SC1	SC2	RL1	RL0	M2	M1	M0	BCD

A/D Converter

The A/D converter has two ports at the base address. The low order byte (D0-D7) of the 12-bit converted data occupies the low order port, while the remaining bits (D8-D11) are in the four least significant positions of the high order port. The status bit EOC at the port will be set when an A/D conversion is finished, (polling mode only) and the reset after the converted data is read. The conversion mode, read mode, channel selection and internal timer setup can be selected by setting the proper bits at these two ports.

D/A Converter

The D/A converter occupies two ports at the base address. The low order byte of output data must be sent to the low order port, and the upper four bits to the four least significant positions of the port. The upper four bits control the D/A conversion.

Data Coding Example

For analog-to-digital conversion, the following formulae convert the corresponding digital word to the voltage level:

Bipolar:

$$\frac{((4096 - \text{Digital value}) - 2048)}{4096} \times \text{F.S.R.}$$

Unipolar:

$$\frac{(4096 - \text{Digital value})}{4096} \times \text{F.S.R.}$$

F.S.R. = Full Scale Range

For example, if the voltage range is ± 5 volts bipolar and the digital value is 3500 (DACH), the corresponding analog voltage is as follows:

$$\frac{(4096 - 3500) - 2048}{4096} \times \text{F.S.R.}$$

$$= \frac{-1452}{4096} \times 10$$

$$= -3.5049 \text{ Volts}$$

Interface Signal and Pin Assignment

The connections between the ADC interface board and external devices are made by one 68-pin connector on the board: CN1.

L SIDE	PIN NO.	DESCRIPTION	R SIDE	PIN NO.	DESCRIPTION
1	1	CH0_HI/CH0	1	35	D_OUT_0
2	2	CH0_LO/CH8	2	36	D_OUT_1
3	3	CH1_HI/CH1	3	37	D_OUT_2
4	4	CH1_LO/CH9	4	38	D_OUT_3
5	5	CH2_HI/CH2	5	39	D_OUT_4
6	6	CH2_LO/CH10	6	40	D_OUT_5
7	7	CH3_HI/CH3	7	41	D_OUT_6
8	8	CH3_LO/CH11	8	42	D_OUT_7
9	9	CH4_HI/CH4	9	43	DIO_GND
10	10	CH4_LO/CH12	10	44	D_IN_0
11	11	CH5_HI/CH5	11	45	D_IN_1
12	12	CH5_LO/CH13	12	46	D_IN_2
13	13	CH6_HI/CH6	13	47	D_IN_3
14	14	CH6_LO/CH14	14	48	D_IN_4
15	15	CH7_HI/CH7	15	49	D_IN_5
16	16	CH7_LO/CH15	16	50	D_IN_6
17	17	ANALOG GND	17	51	D_IN_7
18	18	DAC_0_OUT	18	52	DIO_GND
19	19	ANALOG GND	19	53	CLK_2
20	20	DAC_1_OUT	20	54	GATE_2
21	21	ANALOG GND	21	55	OUT_2
22	22		22	56	CLK_1
23	23		23	57	GATE_1
24	24		24	58	OUT_1
25	25		25	59	
26	26		26	60	GATE_0
27	27	PB_NC	27	61	OUT_0
28	28	PB_NO	28	62	
29	29		29	63	
30	30		30	64	
31	31		31	65	
32	32		32	66	
33	33	DIO_GND	33	67	DIO_GND
34	34	+5VDC	34	68	+5VDC

Software

Function List of ADC400 Driver

Function name	Description
init_brd	Initialize the board
reset	reset the interrupt latch orp/o reset
set_int	set the interrupt
int_sts	read the interrupt status
set_cnt_mod	set the counter mode
rd_cnt_mod	set the counter mode status
set_cnt	set the count

rd_cnt read the count
set_scn_lst set the scan list register
rd_covrg read the conversion configuration register
set_cov_mod set the conversion mode
set_dma_mod set the DMA mode
a2din read the analog to digital conversion data
d2aout set the digital to analog data
go_cov conversion start
out_do set the digital output
in_di read the digital input
set_intz set the digital input interrupt mode
mes_frq measure the unknown frequency
mes_pls measure the unknown pulse

Accessories

- A. Included with the board
1. Diskette – with drivers and sample programs
 2. Users Manual

B. Optional – to be ordered extra

MT/68-Cable

A 4 foot, flat ribbon cable with 68-pin male I/O connectors at either end.

MT/S Cable

A 4 foot, twisted pair shielded cable with 68-pin male I/O connectors at either end.

MT/34 Cable

A 4 foot, flat ribbon cable with one 68-pin male I/O connector at one end and two 34-pin D-type male connectors at the other end.

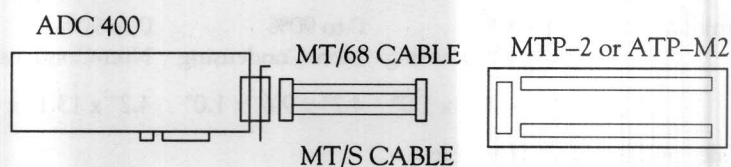
MTP-2

A screw termination panel. It supports 68 screw terminals for field connections and one 68-pin I/O connector for connection to an interface board. The screw terminals accept 12 – 22 AWG wires.

ATP-M2

Analog input termination and multiplexer board. Multiplexes 16 differential inputs into one output. Expands input capacities of analog boards. Enables thermocouples to be connected directly for temperature measurement.

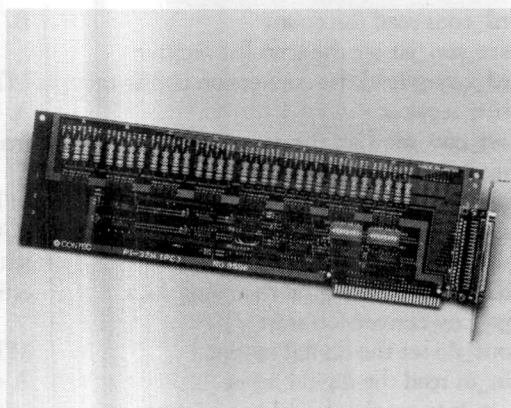
Product Configuration



**3-YEAR
WARRANTY**

PI-32

32-Channel Digital Input Boards



Features

- Plug-in board for IBM PC/XT/AT bus
- 32 digital input channels
- TTL compatible inputs (PI-32T)
- Opto-isolated inputs PI-32L, PI-32H
- Two interrupt lines
- Selectable base address
- Easy to use software
- High-level utility and application program support:
Labtech Notebook, Labtech Control, Labtech Acquire, OnSpec, Module-PAC

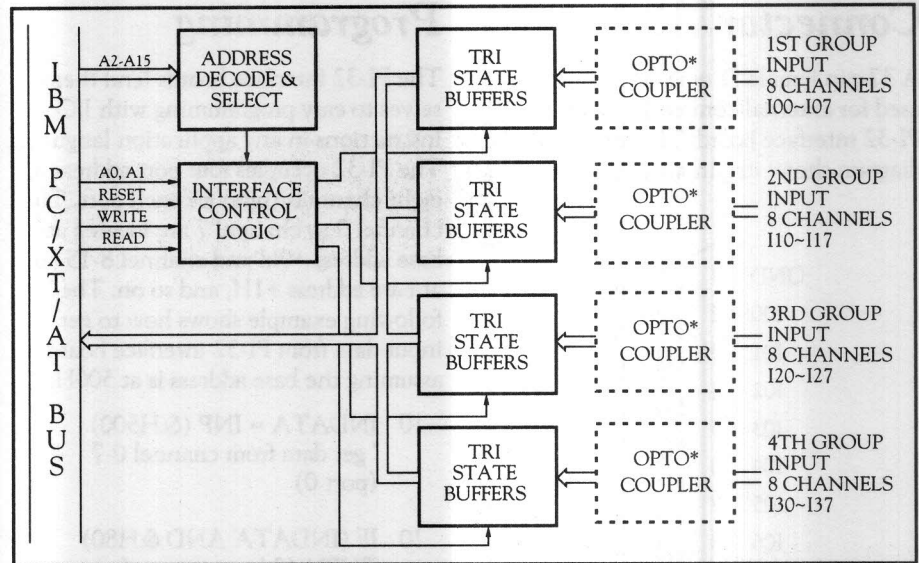
Specifications

Product Name	PI-32 T	PI-32 L	PI-32 H
■ Inputs	32	32	32
■ Type	TTL	Opto-isolated	Opto-isolated
■ Isolation Voltage	—	5000 VRMS	5000 VRMS
■ Throughput Time	1 μ s MAX	1 ms MAX	1 ms MAX
■ Input Resistance	3 K Ω	2 K Ω 6 – 12 mA	12 K Ω 4 – 5 mA
■ Power Consumption	5 VDC 420 mA MAX	5 VDC 420 mA MAX	5 VDC 420 mA MAX
■ External Power Supply	—	12 – 24 VDC	48 – 60 VDC
■ Interrupts	2	2	2
■ Operating Temperature	0 to 60°C	0 to 60°C	0 to 60°C
■ Relative Humidity	0 to 90% Non-Condensing	0 to 90% Non-Condensing	0 to 90% Non-Condensing
■ Dimensions	4.2" x 9.6" x 1.0"	4.2" x 9.6" x 1.0"	4.2" x 13.1" x 1.0"
■ Occupy one slot on IBM PC/XT/AT Bus			
■ Address Selection: any 4 byte boundary			
■ External connections via: one 37 pin D-connector			

PI-32

Functional Description

The PI-32 is a 32 channel digital input interface board for data acquisition and control for IBM PC/XT/AT computers and compatibles. The boards are available in TTL-level input or opto-isolated versions. These boards are flexible in use and provide a wide variety of applications for the parallel input from devices such as instruments, user designed systems and signal control equipment. The base address of the I/O port can be selected by the use of two DIP switches. The board occupies four port addresses which are mapped directly to the IBM PC bus, making the boards easy to use.

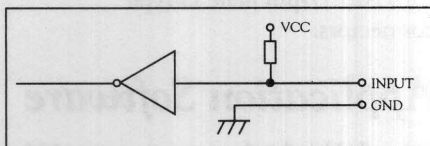


PI-32 BLOCK DIAGRAM
*FOR PI-32L AND PI-32H ONLY

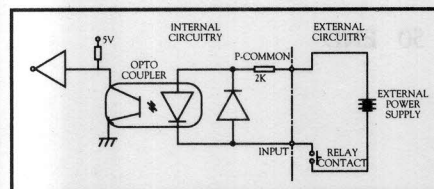
Input Circuitry

PI-32

TTL INPUT CIRCUITRY



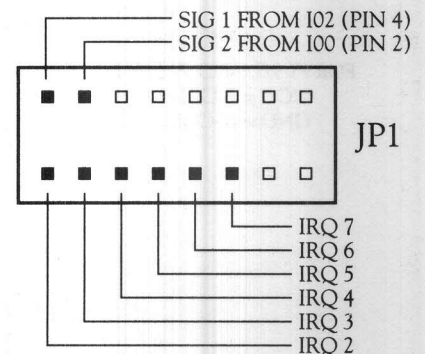
PI-32 L/H ISOLATED INPUT CIRCUITRY



ISOLATED INPUT CIRCUITRY

Interrupt Jumper

PI-32 interface boards provide two interrupt lines to connect with external devices for the event driven applications. Input channels 0 and 2 on port 0 can be used for this purpose.



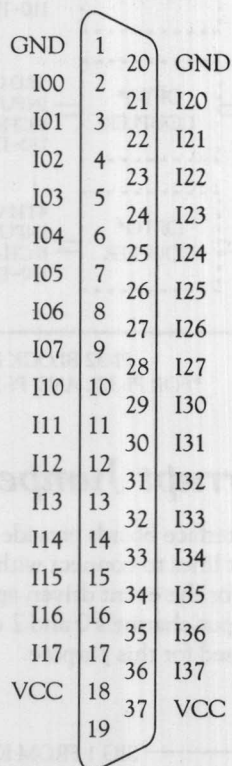
Base Address

The base address of the interface board can be selected by setting two 8-position DIP switches, SW1 and SW2. This board requires four consecutive addresses for its internal use.

3-YEAR
WARRANTY

Connector

A 37-pin female D-type connector is used for external connections to the PI-32 interface board. The following diagram shows its pin assignments:



FOR PI-32L AND PI-32H ONLY
VCC = P-COMMON
GND = N-COMMON

Programming

The PI-32 interface boards lend themselves to easy programming with I/O instructions in any application language. The PI-32 occupies four port addresses, eight channels (bits) for each port. The channel 0 to channel 7 are located at base address +0H and channel 8-15 are at base address +1H, and so on. The following example shows how to get input data from PI-32 interface board, assuming the base address is at 500H.

```

10  INDATA = INP (&H500)
    ' get data from channel 0-7
    (port 0)

20  IF (INDATA AND &H80)
    THEN 40 ' test status of
    channel 6

30  PRINT "CHANNEL 6 IS OFF":
    GOTO 50 ' bit = 0 means OFF

40  PRINT "CHANNEL 6 IS ON":
    ' bit = 1 means ON

50  END

```

Accessories

- A. Included with the board
 1. D-Connector (loose)
 2. Users manual
 3. Floppy disk containing sample programs
- B. Optional – to be ordered extra

1610010 CHECKMATE CM-32

Checkmate is a debugger for the PIO Series. It can display and control up to 32 input/output signals at once.

1180010 DTP-1

Digital terminal panel for PIO Series boards with 36 flat mount type terminals.

1180020 DTP-2

Digital terminal panel for PIO Series boards with 36 miniature type terminals.

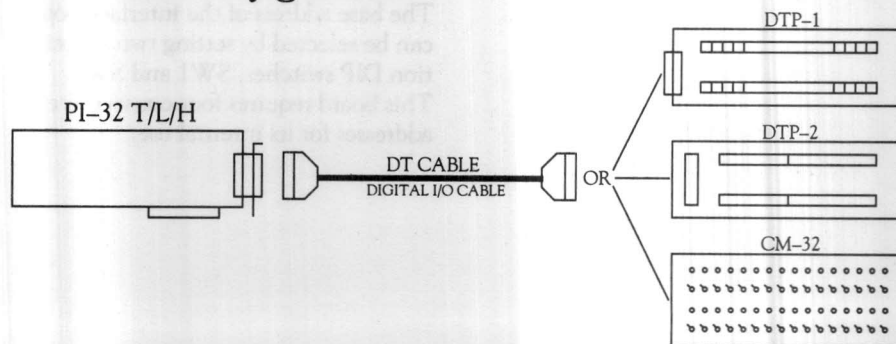
1180030 DT-CABLE

Four foot long 20 twisted pair shielded with two 37-pin male D-type connectors.

Application Software

Labtech Notebook	p. 132
Labtech Control	p. 134
Module-PAC	p. 145
Onspec	

Product Configuration

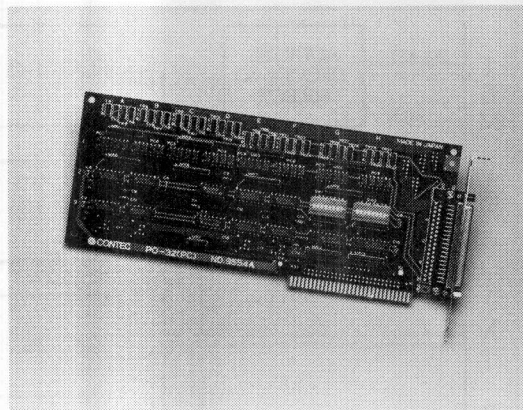


3-YEAR
WARRANTY

CONTEC

PO-32

32-Channel Digital Output Boards



Features

- Plug-in board for IBM PC/XT/AT bus
- 32 digital output channels
- High fanout TTL compatible outputs (PO-32T)
- Opto-isolated outputs PO-32L, PO-32H
- Selectable base address
- Easy to use software
- High-level utility and application program support:
Labtech Notebook, Labtech Control, Labtech Acquire, OnSpec, Module-PAC

Specifications

Product Name	PO-32 T	PO-32 L	PO-32 H
■ Outputs	32	32	32
■ Type	TT	Opto-isolated	Opto-isolated
■ Isolation Voltage	—	5000 VRMS	5000 VRMS
■ Throughput Time	1 μ s MAX	1 ms MAX	1 ms MAX
■ Output Level	5 VDC	25 VDC	60 VDC
■ Sink Current	40 mA MAX	200 mA	200 mA
■ Power Consumption	5 VDC 550 mA MAX	5 VDC 420 mA MAX	5 VDC 420 mA MAX
■ External Power Supply	—	12-24 VDC	48-60 VDC
■ Operating Temperature	0 to 60°C	0 to 60°C	0 to 60°C
■ Relative Humidity	0 to 90% Non-Condensing	0 to 90% Non-Condensing	0 to 90% Non-Condensing
■ Dimensions	4.2" x 9.6" x 1.0"	4.2" x 9.6" x 1.0"	4.2" x 13.1" x 1.0"
■ Occupy one slot on IBM PC/XT/AT Bus			
■ Address Selection: Any 4 byte boundary			
■ External connections via: one 37-pin D-connector			

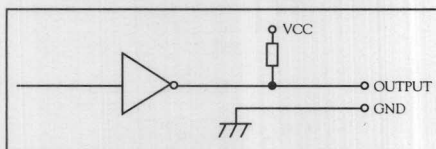
3-YEAR
WARRANTY

Functional Description

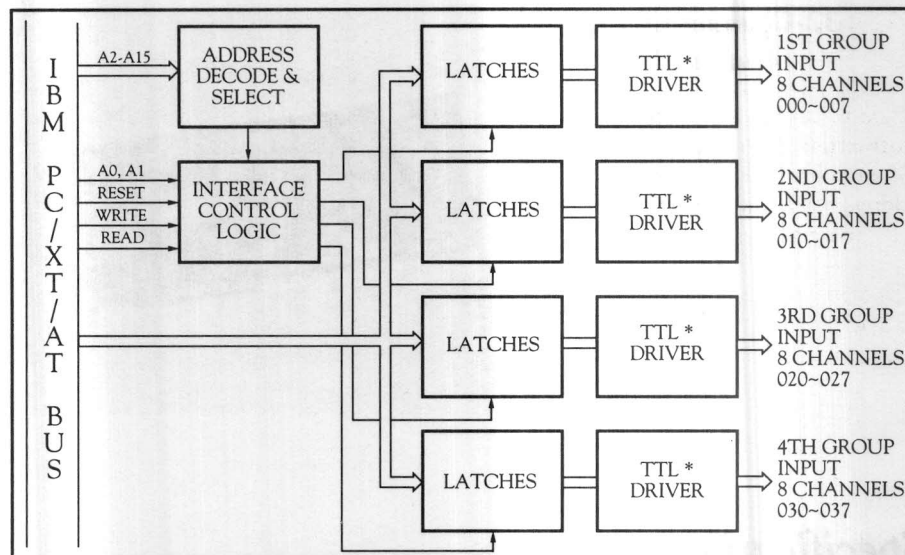
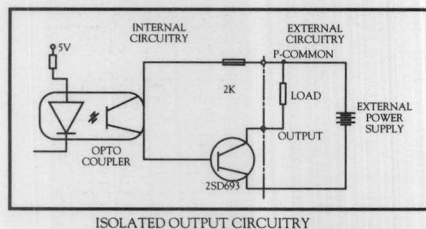
The CONTEC PO-32 is a thirty-two channel digital output interface board for data acquisition and control for IBM PC/XT/AT computers and compatibles. The boards are available in TTL-level (T type) and opto-isolated (L or H type) output versions. These boards are flexible in use and provide a wide variety of applications for the parallel output operations to control devices such as instruments, user designed systems and signal control equipment. The opto-isolated type is particularly suitable for a severe industrial environment. The base address of the I/O port can be selected by the use of two DIP switches. The board occupies four port addresses and they are mapped directly to the IBM PC bus, making the boards easy to use.

Output Circuitry

PO-32 TTL OUTPUT CIRCUITRY



PO-32 L/H ISOLATED OUTPUT CIRCUITRY



PO-32 BLOCK DIAGRAM
* FOR PO-32L AND PO-32H—REPLACED BY
OPTO-COUPLER AND TRANSISTOR CIRCUIT

Base Address

The base address of the interface board can be selected by setting two 8-position DIP switches, SW1 and SW2. This board requires four consecutive addresses for its internal use.

Connector

A female 37-pin D-type connector is used for external connection to the PO-32 interface board. The following diagram shows its pin assignment.

GND	1	20	GND
O00	2	21	O20
O01	3	22	O21
O02	4	23	O22
O03	5	24	O23
O04	6	25	O24
O05	7	26	O25
O06	8	27	O26
O07	9	28	O27
O10	10	29	O30
O11	11	30	O31
O12	12	31	O32
O13	13	32	O33
O14	14	33	O34
O15	15	34	O35
O16	16	35	O36
O17	17	36	O37
VCC	18	37	VCC
	19		

FOR PO-32L AND PO-32H
VCC = P-COMMON
GND = N-COMMON

PO-32

Programming

The PO-32 interface boards lend themselves to easy programming with I/O instructions in any application language. Output channels 0-7 are located at base address +0H, and output channel 8-15 are at base address +1H, and so on.

The follow example shows how to write data to the output ports in BASICA. The base address is at 500H.

- ```

10 OUTDATA = 0 ' all channels OFF
 on one port

20 OUT &H500, OUTDATA ' turn
 off channel 0-7 (port 0)

30 OUTDATA = &HFF ' all
 channels ON on one port

40 OUT &H503, OUTDATA ' turn
 on channel 24-31 (port 3)

```

### Accessories

- A. Included with the board
1. D-Connector (loose)
  2. Users manual
  3. Floppy disk containing sample programs
- B. Optional - To be ordered extra

#### 1610010 CM-32

Check-mate is a debugger for the PIO Series. It can display and control up to 32 input/output signals at once.

#### 1180010 DTP-1

Digital terminal panel for PIO Series boards with 36 flat mount type terminals.

#### 1180020 DTP-2

Digital terminal panel for PIO Series boards with 36 miniature type terminal.

#### 1180030 DT-CABLE

Four foot long, 20 twisted pair shielded with two 37-pin male D-type connectors.

#### 1180050 DTP-R

16 channel relay output terminal panel with LED indicator per channel.

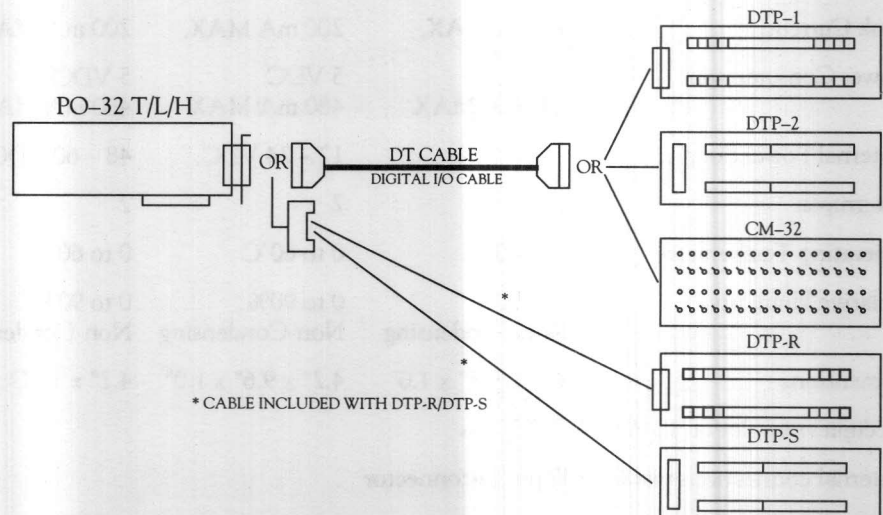
#### 1180060 DTP-S

Terminal panel with 8 optically isolated solid state relays and 8 external relays drivers.

### Application Software

|                  |        |
|------------------|--------|
| Labtech Notebook | p. 132 |
| Labtech Control  | p. 134 |
| Module-PAC       | p. 145 |
| Onspec           |        |

### Product Configuration

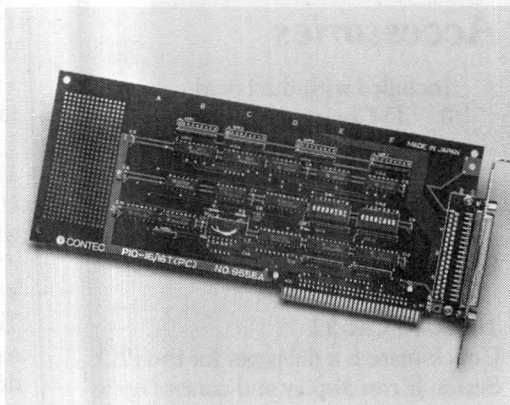




**3-YEAR  
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# PIO-16/16

## 16/16 Channel Digital Input/Output Boards



## Features

- Plug-in board for IBM PC/XT/AT bus
- 16 digital input and 16 digital output channels
- High TTL fanout (PIO-16/16T)
- Opto-isolated inputs and outputs, PIO-16/16L, PIO-16/16H
- 2 interrupts lines
- Selectable base address
- Easy to use software
- High level utility and application program support: Labtech Control, Labtech Notebook, Labtech Acquire, OnSpec, Module-PAC

## Specifications

| Product Name                                       | PIO-16/16 T                | PIO-16/16 L                | PIO-16/16 H                |
|----------------------------------------------------|----------------------------|----------------------------|----------------------------|
| ■ Inputs                                           | 16                         | 16                         | 16                         |
| ■ Outputs                                          | 16                         | 16                         | 16                         |
| ■ Type                                             | TTL                        | Opto-isolated              | Opto-isolated              |
| ■ Isolation Voltage:                               | —                          | 5000 VRMS                  | 5000 VRMS                  |
| ■ Throughput Time                                  | 1 $\mu$ s MAX              | 1 ms MAX                   | 1 ms MAX                   |
| ■ Input Resistance                                 | 3 K $\Omega$               | 2 K $\Omega$               | 12 K $\Omega$              |
| ■ Output Level:                                    | 5 VDC MAX                  | 35 VDC MAX                 | 60 VDC MAX                 |
| ■ Sink Current:                                    | 40 mA MAX,                 | 200 mA MAX,                | 200 mA MAX                 |
| ■ Power Consumption                                | 5 VDC<br>480 mA MAX        | 5 VDC<br>480 mA MAX        | 5 VDC<br>480 mA MAX        |
| ■ External Power Supply:                           | —                          | 12 – 24 VDC:               | 48 – 60 VDC                |
| ■ Interrupts:                                      | 2                          | 2                          | 2                          |
| ■ Operating Temperature                            | 0 to 60°C                  | 0 to 60°C                  | 0 to 60°C                  |
| ■ Relative Humidity                                | 0 to 90%<br>Non-Condensing | 0 to 90%<br>Non-Condensing | 0 to 90%<br>Non-Condensing |
| ■ Dimensions                                       | 4.2" x 9.6" x 1.0"         | 4.2" x 9.6" x 1.0"         | 4.2" x 13.1" x 1.0"        |
| ■ Occupies one slot on IBM PC/XT/AT bus            |                            |                            |                            |
| ■ External connections via: One 37 pin D-connector |                            |                            |                            |
| ■ Address Selection: Any two byte boundary         |                            |                            |                            |

**Toll Free Number 1-800-888-8884**

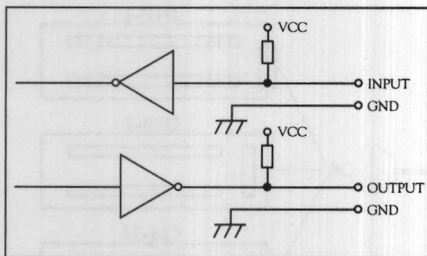
## PIO-16/16

### Functional Description

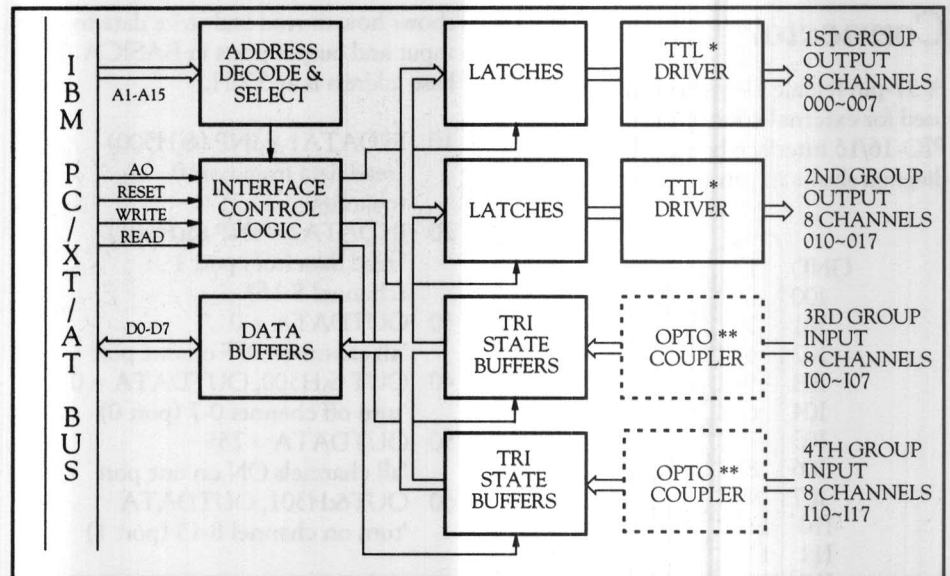
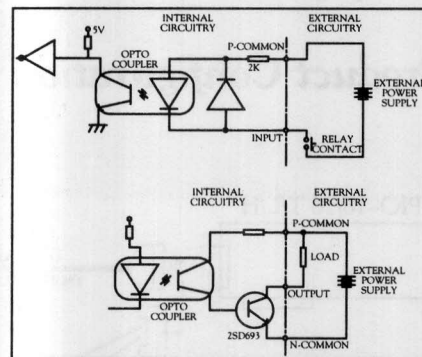
The PIO-16/16 is a digital input/output interface board for data acquisition and control for IBM PC/XT/AT computers and compatibles. It provides 16 inputs and outputs on a signal board. The boards are available in TTL-level (T type) or opto-isolated (L or H type) input/output version. These boards are flexible in use and provide a wide variety of applications for the parallel input/output devices such as instruments, user designed systems and signal control equipment. The base address of the I/O port can be selected by the use of two DIP switches. The board occupies two port addresses and they are mapped directly to the IBM PC Bus, making the boards easy to use.

### Input/Output Circuitry

#### PIO-16/16T TTL INPUT/OUTPUT CIRCUITRY



#### PIO-16/16L/H ISOLATED INPUT/OUTPUT CIRCUITRY



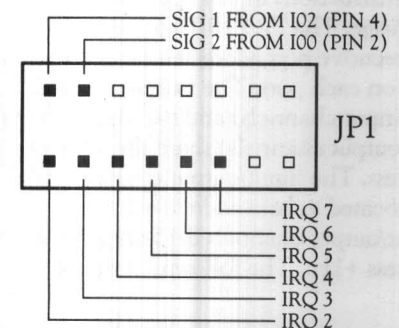
PIO-16/16 BLOCK DIAGRAM  
\*FOR PIO-16L AND PIO-16H — REPLACED BY OPTOCOUPLER AND TRANSISTOR CIRCUIT  
\*\*FOR PIO-16/16L AND PIO-16/16H ONLY

### Base Address

The base address of the interface board can be selected by setting two 8-position DIP switches, SW 1 and SW2. This board requires two consecutive addresses for its internal use.

### Interrupt Jumper

PIO-16/16 interface boards provide 2 interrupt lines to support real time applications. Input channels 0 and 2 on port 0 can be used for this purpose.



3-YEAR  
WARRANTY

## Connector

A 37-pin female D-type connector is used for external connections to the PIO-16/16 interface board. The following diagram shows its pin assignment.

|     |    |    |     |
|-----|----|----|-----|
| GND | 1  | 20 | GND |
| I00 | 2  | 21 | O20 |
| I01 | 3  | 22 | O21 |
| I02 | 4  | 23 | O22 |
| I03 | 5  | 24 | O23 |
| I04 | 6  | 25 | O24 |
| I05 | 7  | 26 | O25 |
| I06 | 8  | 27 | O26 |
| I07 | 9  | 28 | O27 |
| I10 | 10 | 29 | O30 |
| I11 | 11 | 30 | O31 |
| I12 | 12 | 31 | O32 |
| I13 | 13 | 32 | O33 |
| I14 | 14 | 33 | O34 |
| I15 | 15 | 34 | O35 |
| I16 | 16 | 35 | O36 |
| I17 | 17 | 36 | O37 |
| VCC | 18 | 37 | VCC |

FOR PIO-16/16L AND PIO-16/16H  
VCC = P-COMMON  
GND = N-COMMON

## Programming

The PIO-16/16 interface boards lend themselves to easy programming with I/O instructions in any application language. The PIO-16/16 occupies two consecutive port addresses, eight channels on each port. The two input ports (16 input channels) and two output ports (16 output channels) share the same base address. The input/output channels 0-7 are located at base address +0H, and input/output channels 8-15 are at base address +1H. The following example

shows how to read and write data to the input and output ports in BASICA. The base address is at 500H.

```

10 INDATA1 = INP (&H500)
 ' read data from port 0
 (channel 0-7)
20 INDATA2 = INP (&H501)
 ' read data from port 1
 (channel 8-15)
30 OUTDATA = 0
 'all channels OFF on one port
40 OUT &H500, OUTDATA = 0
 'turn off channel 0-7 (port 0)
50 OUTDATA = 255
 'all channels ON on one port
60 OUT &H501, OUTDATA
 'turn on channel 8-15 (port 1)

```

## Accessories

### Accessories

- A. Included with the board
1. D-Connector (loose)
  2. Users manual
  3. Floppy disk containing sample programs

B. Optional – To be ordered extra

### 1610010 CM-32

Check-mate is a debugger for the PIO Series. It can display and control up to 32 input/output signals at once.

### 1180010 DTP-1

Digital terminal panel for PIO Series boards with 36 flat mount type terminals.

### 1180020 DTP-2

Digital terminal panel for PIO Series boards with 36 miniature type terminals.

### 1180030 DT-Cable

Four foot long, 20 twisted pair shielded with two 37-pin male D-type connectors.

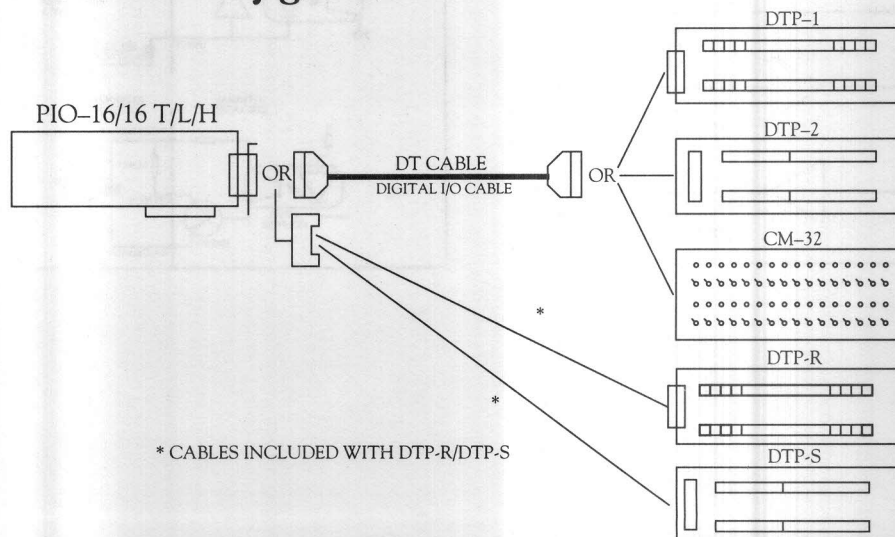
### 1180050 DTP-R

16 channel relay output terminal panel with LED indicator per channel

### 1180060 DTP-S

Terminal panel with 8 optically isolated solid state relays and 8 external relays drivers.

## Product Configuration

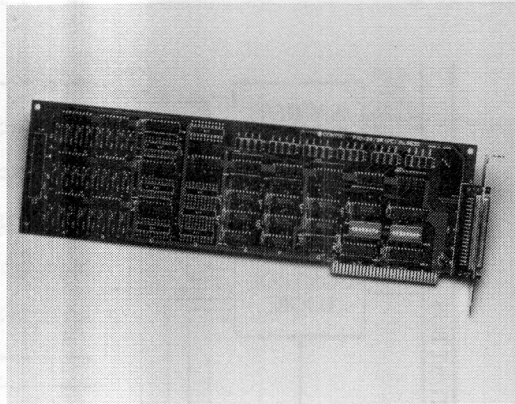


\* CABLES INCLUDED WITH DTP-R/DTP-S



# PIO-24/24L

## 24/24 Channel Digital Input/Output Board



## Features

- Plug-in board for the IBM PC/XT/AT Bus
- 24 digital input and 24 output channels
- Opto-isolated inputs and outputs
- Interrupt lines
- Selectable base address

## Specifications

- Digital Input
  - Number of Inputs: 24 channels
  - Input Type: Opto-isolated
  - Input Impedance: 2 Kohms (24V 12mA per channel)
  - Number of Interrupts: 4 channels
  - Throughput Time: 1 millisecond
- Digital Output
  - Number of Outputs: 24 channels
  - Output Type: Opto-isolated
  - Sink Current: 35V 200mA maximum
  - Throughput Time: 1 millisecond
- High-level utility program support: Module-PAC
- Interrupts: 4
- Address Selection
  - Any 4-byte boundary
- General
  - Occupies one slot on IBM PC/XT/AT bus
  - Power Consumption: +5V 750mA
  - External Power Supply: 12V 200mA or 24V 400mA
  - Operating Temperature: 0 to 50°C
  - Storage Temperature: -40 to 70°C
  - Relative Humidity: 0 to 90% non-condensing
  - Dimensions: 4.2" x 13.1" x 1.0"
  - External Connections via: One 30 pin-header connector for digital inputs, one 37-pin D-connector for digital outputs

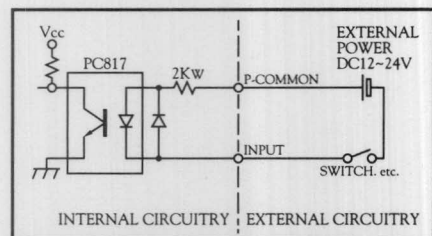
3-YEAR  
WARRANTY

## Functional Description

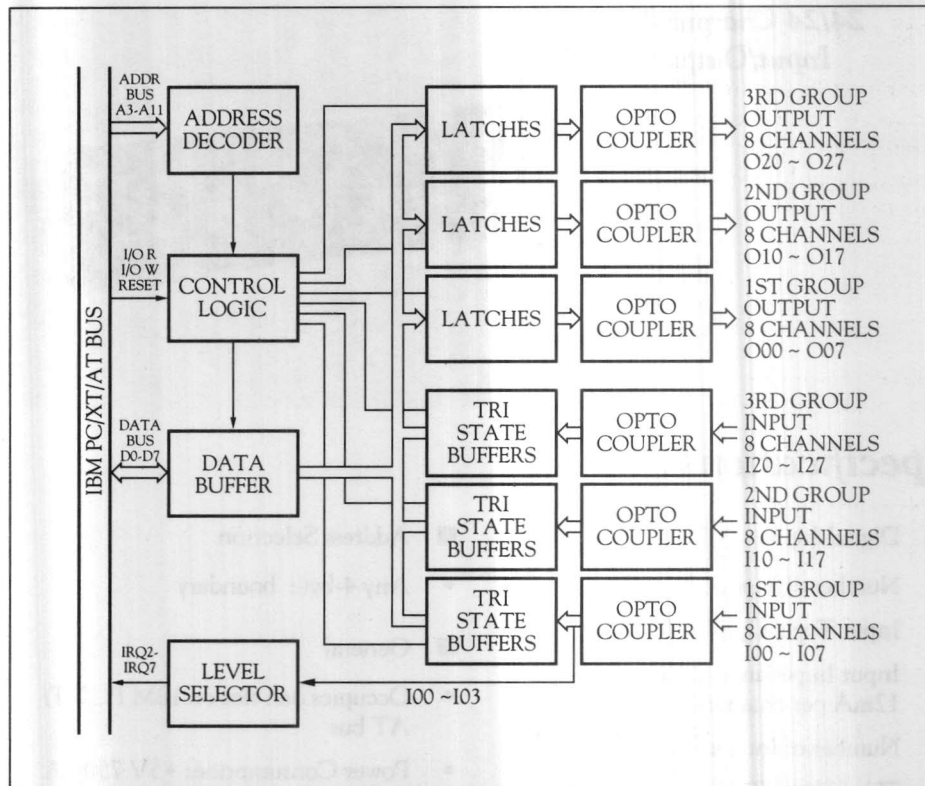
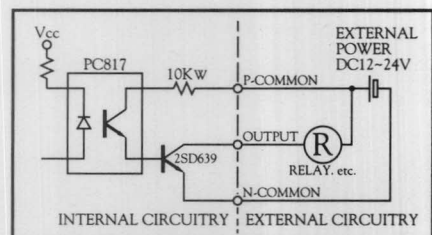
The PIO-24/24L is a digital input/output interface board used for data acquisition and control for IBM PC/XT/AT computers and compatibles. This interface board provides 24 opto-isolated input channels and 24 opto-isolated output channels. These channels are divided into six groups of eight channels each, and are isolated from the internal circuit by optocouplers. Four of the 24 input channels can be used as interrupt signals. The base address of the I/O port is selected through the use of two DIP-switches. The board occupies four port addresses for its internal use.

## Input/Output Circuitry

### INPUT CIRCUITRY



### OUTPUT CIRCUITRY



## Base Address

The base address of the PIO-24/24L interface board can be selected by setting two eight-position DIP-switches, SW1 and SW2.

## Input/Output Port

An I/O port can be addressed by the port's base address and offset. Only three consecutive port addresses are required for input and output ports on the PIO-24/24L. The following table details the I/O port assignments.

### INPUT (read only)

|     | D7                | D6  | D5  | D4  | D3  | D2  | D1  | D0  |
|-----|-------------------|-----|-----|-----|-----|-----|-----|-----|
| +0H | 1ST GROUP (INPUT) |     |     |     |     |     |     |     |
|     | I07               | I06 | I05 | I04 | I03 | I02 | I01 | I00 |
| +1H | 2ND GROUP (INPUT) |     |     |     |     |     |     |     |
|     | I17               | I16 | I15 | I14 | I13 | I12 | I11 | I10 |
| +2H | 3RD GROUP (INPUT) |     |     |     |     |     |     |     |
|     | I27               | I26 | I25 | I24 | I23 | I22 | I21 | I20 |

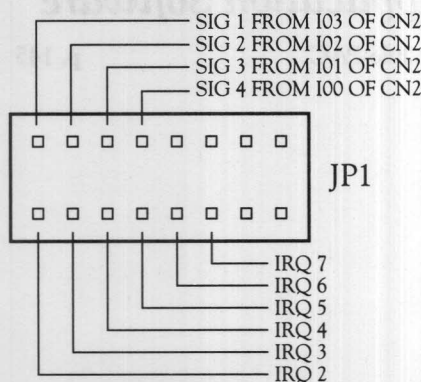
### OUTPUT (write only)

|     | D7                 | D6  | D5  | D4  | D3  | D2  | D1  | D0  |
|-----|--------------------|-----|-----|-----|-----|-----|-----|-----|
| +0H | 1ST GROUP (OUTPUT) |     |     |     |     |     |     |     |
|     | O07                | O06 | O05 | O04 | O03 | O02 | O01 | O00 |
| +1H | 2ND GROUP (OUTPUT) |     |     |     |     |     |     |     |
|     | O17                | O16 | O15 | O14 | O13 | O12 | O11 | O10 |
| +2H | 3RD GROUP (OUTPUT) |     |     |     |     |     |     |     |
|     | O27                | O26 | O25 | O24 | O23 | O22 | O21 | O20 |

## PIO-24/24L

### Interrupt Jumper

The PIO-24/24L interface board can accept up to four external interrupt signals. This is done by connecting the desired signal line to an IRQ level via a jumper on JP1.



### Interface Connectors

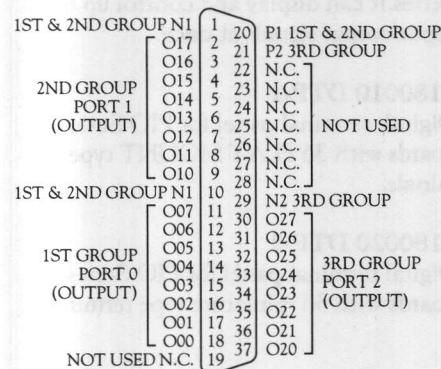
External connections to the PIO-24/24L are via two connectors as follows:

CN1 – 37-pin D-connector for digital outputs

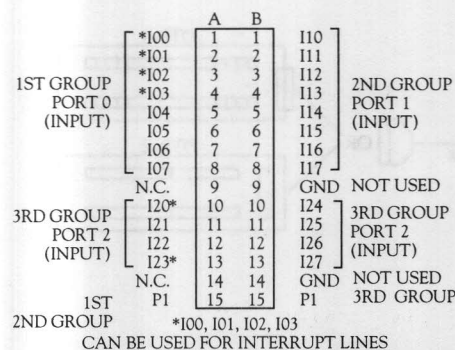
CN2 – 30-pin header-connector for digital inputs

The following diagrams show the connector pin assignments.

### REAR VIEW OF CN1 (outputs)



### TOP VIEW OF CN2 (inputs)



P1, P2 = P-COMMON  
N1, N2 = N-COMMON

### Programming

The PIO24/24L interface boards lend themselves to easy programming with I/O instructions in any application language. The PIO-24/24L occupies three consecutive port addresses, eight channels on each port. The three input ports (24 input channels) share the same base address.

The following example shows how to read and write data to the input and output ports in BASIC. The base address is at &H500.

```
100 DATA1 = INP (&H500) 'read from
 port 0
110 DATA2 = INP (&H501) 'read from
 port 1
120 OUT &H500, 0 'turn off channel
 0 to 7
130 OUT &502,255 'turn on channel
 16 to 23
```



3-YEAR  
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## Accessories

### Accessories

- A. Included with the board
  - 1. D-Connector (loose)
  - 2. Users manual
  - 3. Floppy disk containing sample programs
- B. Optional – To be ordered extra

### 1610010 CM-32

Check-mate is a debugger for the PIO Series. It can display and control up to 32 input/output signals at once.

### 1180010 DTP-1

Digital terminal panel for PIO Series boards with 36 FLAT MOUNT type terminals.

### 1180020 DTP-2

Digital terminal panel for PIO Series boards with 36 miniature type terminals.

### 1180030 DT-CABLE

Four foot long, 20 twisted pair shielded with two 37-pin male D-type connectors.

### 1180040 DT-Bracket

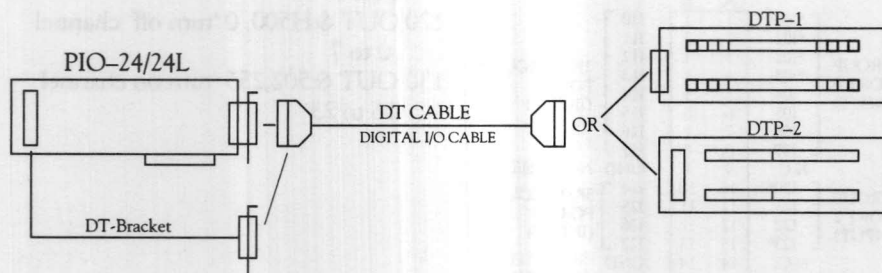
1 1/2 foot long, flat cable with 37-pin female D-type connector and bracket.

## Application Software

Module-PAC

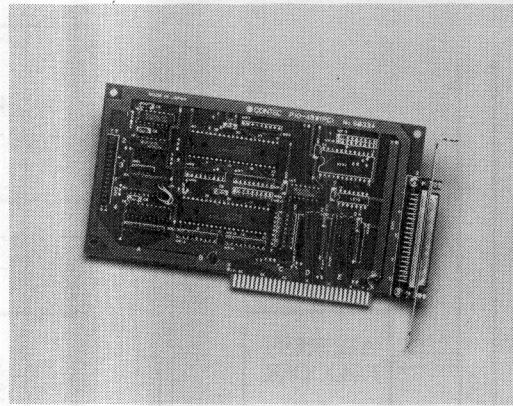
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## Product Configuration



# PIO-48 Series

**48 Bidirectional Digital  
I/O Boards**  
PIO-48W, PIO-48C,  
PIO-48R



## Specifications

- Digital Input/Output
  - Number of channels: 48
  - I/O Logic: TTL
  - I/O Interface: Two 8255A-5
  - Input load: 1 LS-TTL
  - Fan out: 2 LS-TTL (5V, 1mA)
- Counter Timer (PIO-48C only)
  - Number of counters: 2
  - Input frequency: DC to 6.0 MHz
  - Counter setting: 16-bits (BCD or binary)
  - Number of timers: 1
  - Timer Clock: 1/2 CPU frequency
- Serial Communication (PIO-48R only)
  - Number of channels: 1
  - I/O specifications: EIA RS-232C or current loop
  - Transmission: Asynchronous, full- or half-duplex
  - LSI: 8250 or equivalent
  - Number of occupied ports: 8
  - I/O selection: on-board jumper
- Interrupt Lines
  - Number of interrupt channels: PIO-48W, PIO-48C: 4  
PIO-48R: 5, (4 from DI/O and 1 from Serial I/O)
  - Occupied interrupt levels: PIO-48W, PIO-48C: 4  
PIO-48R: 5 (IRQ2-IRQ7)
- Address Selection
  - PIO-48W, PIO-48C: Any 16 byte boundary
  - PIO-48R: Any 8 byte boundary
- General
  - Occupies one slot in an IBM PC/XT/AT bus
  - Power requirements:  
PIO-48W:  $\pm 5$ DVC, 430mA  
PIO-48C:  $\pm 5$ DVC, 430mA  
PIO-48R:  $\pm 5$ DVC, 430mA, +12VDC, 30mA, -12VDC, 30mA

## Features:

### PIO-48W

- Plug-in board for IBM PC/XT/AT Bus
- 48 bidirectional digital I/O channels
- Four channel interrupt handling
- Selectable base address
- Easy-to-use software support with sample programs
- High-level utility program supports Module-PAC

### PIO-48C (PIO-48W plus)

- Provides three 16-bit counters
- One connected to system clock

### PIO-48R (PIO-48W plus)

- Provides one serial communication channel for RS-232C or current loop
- Can be set as COM1 or COM2
- Can be used for interrupt handling

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## PIO-48 Series

### Specifications (Continued)

- Operating Temperature: 0 to 50°C
- Storage Temperature: (-40) to 70°C
- Relative Humidity: 0 to 90% non-condensing
- Size: 4.2" x 7.3" x 1.0"
- External Connections via:  
1 x 37 pin D-Connector  
1 x 30 pin header connector

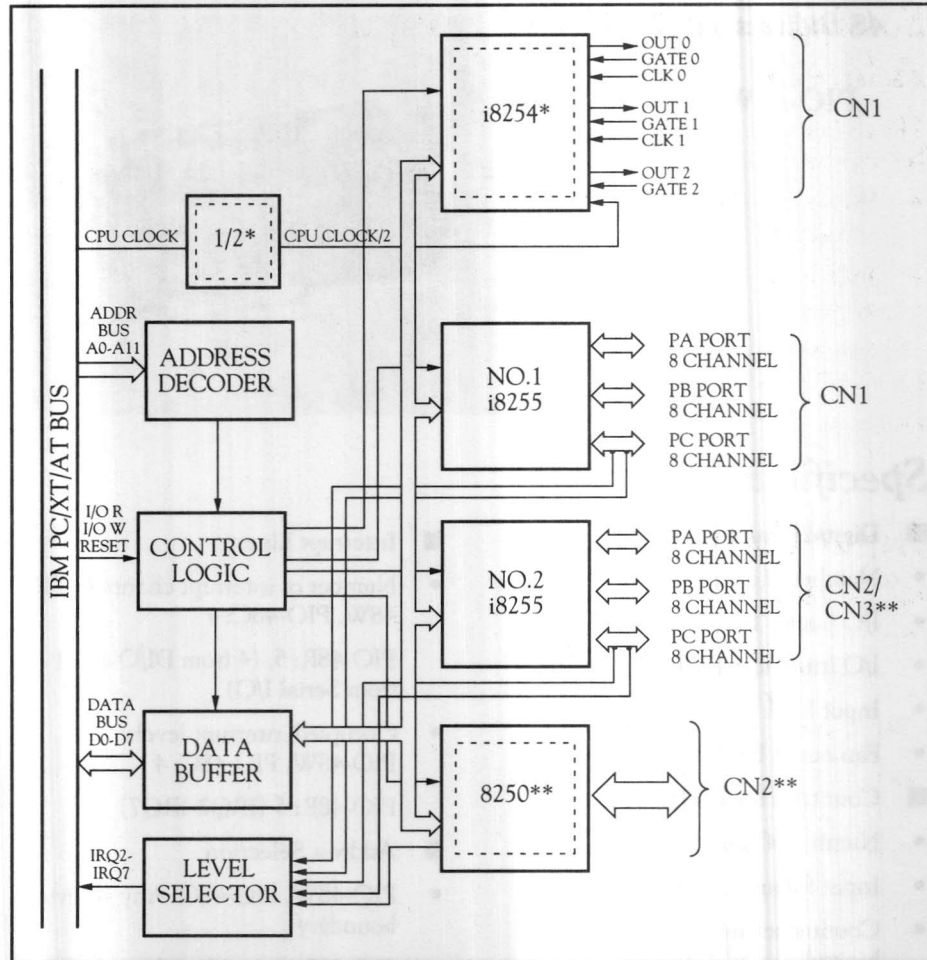
**PIO-48R:** additional 1x 26 pin header connector for serial communication.

### Functional Description

The CONTEC **PIO-48W**, **PIO-48C** and **PIO-48R** are plug-in, digital input/output interface boards for IBM PC/XT/AT computers. They are ideal for laboratory and industrial data acquisition and control applications.

The boards provide 48 bidirectional TTL-level I/O channels. Two 8255A-5 programmable I/O chips are used. Each chip provides three ports, A, B, and C. Each port in turn contains eight channels. The individual ports can be programmed to have their corresponding channels as inputs or outputs.

External connections to the board are via 37-pin D-connectors, and a 30-pin header connector, which carry the digital I/O lines. In case of **PIO-48C**, the timer/counter lines are connected to the D-connector. In case of **PIO-48R**, an additional 26-pin header connector is provided for the serial communication lines.



\*PIO-48C ONLY  
\*\*PIO-48R ONLY

Four out of the 48 Digital I/O lines can be used for interrupt handling. In case of **PIO-48R**, an additional interrupt line is available from the serial communication port. These can be used for interrupt levels IRQ2 to IRQ7. Selection is via jumpers on board.

The **PIO-48C** also has a i8254 LSI programmable timer/counter chip, which contains three 16-bit counters, each being independently programmable. One of the counters is connected to the system clock with a

frequency of one-half the CPU clock frequency. The other two counters use an external clock.

The **PIO-48R** uses a 8250 LSI chip for serial communication through a RS-232C or current loop connection. It is compatible with DOS COM1 or COM2 ports. An interrupt signal can be generated through this communication port.

Power for the board is drawn from the PC. (PIO-48W and PIO-48C +5V; PIO-48R +5V, +12V, and -12V).



## Setting Up I/O Board Address

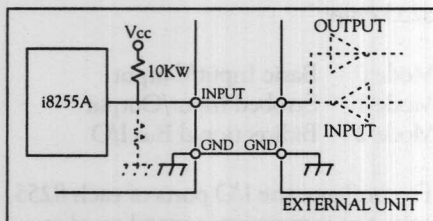
The address requirements for these boards is as follows:

- **PIO-48W, PIO-48C:** any 16 consecutive addresses
- **PIO-48R:** any 8 consecutive addresses

The base address can be set using on-board DIP-switches.

(Note: Some addresses are reserved for the IBM-PC and other boards.)

## Input/Output Circuitry



## Input/Output Port

The 8255A-5 programmable I/O chips support three ports, A, B, and C, containing eight channels each. The following tables detail the I/O port assignments for each 8255 chip, (as well as for the timer/counter chip 8254 on the PIO-48C).

### PROGRAMMABLE DIGITAL I/O

|     | D7                   | D6  | D5  | D4  | D3  | D2  | D1  | D0  |
|-----|----------------------|-----|-----|-----|-----|-----|-----|-----|
| +0H | PORT A OF 8255       |     |     |     |     |     |     |     |
|     | PA7                  | PA6 | PA5 | PA4 | PA3 | PA2 | PA1 | PA0 |
| +1H | PORT B OF 8255       |     |     |     |     |     |     |     |
|     | PB7                  | PB6 | PB5 | PB4 | PB3 | PB2 | PB1 | PB0 |
| +2H | PORT C OF 8255       |     |     |     |     |     |     |     |
|     | PC7                  | PC6 | PC5 | PC4 | PC3 | PC2 | PC1 | PC0 |
| +3H | CONTROL WORD OF 8255 |     |     |     |     |     |     |     |
|     | CW7                  | CW6 | CW5 | CW4 | CW3 | CW2 | CW1 | CW0 |

### PROGRAMMABLE DIGITAL I/O

|     | D7                   | D6  | D5  | D4  | D3  | D2  | D1  | D0  |
|-----|----------------------|-----|-----|-----|-----|-----|-----|-----|
| +4H | PORT A OF 8255       |     |     |     |     |     |     |     |
|     | PA7                  | PA6 | PA5 | PA4 | PA3 | PA2 | PA1 | PA0 |
| +5H | PORT B OF 8255       |     |     |     |     |     |     |     |
|     | PB7                  | PB6 | PB5 | PB4 | PB3 | PB2 | PB1 | PB0 |
| +6H | PORT C OF 8255       |     |     |     |     |     |     |     |
|     | PC7                  | PC6 | PC5 | PC4 | PC3 | PC2 | PC1 | PC0 |
| +7H | CONTROL WORD OF 8255 |     |     |     |     |     |     |     |
|     | CW7                  | CW6 | CW5 | CW4 | CW3 | CW2 | CW1 | CW0 |

### PROGRAMMABLE COUNTER (PIO-48C only)

|     | D7                   | D6  | D5  | D4  | D3 | D2 | D1 | D0  |
|-----|----------------------|-----|-----|-----|----|----|----|-----|
| +8H | COUNTER 0 OF 8254    |     |     |     |    |    |    |     |
|     | D7                   | D6  | D5  | D4  | D3 | D2 | D1 | D0  |
| +9H | COUNTER 1 OF 8254    |     |     |     |    |    |    |     |
|     | D7                   | D6  | D5  | D4  | D3 | D2 | D1 | D0  |
| +AH | COUNTER 2 OF 8254    |     |     |     |    |    |    |     |
|     | D7                   | D6  | D5  | D4  | D3 | D2 | D1 | D0  |
| +BH | CONTROL WORD OF 8254 |     |     |     |    |    |    |     |
|     | SC1                  | SC0 | RL1 | RL0 | M2 | M1 | M0 | BCD |

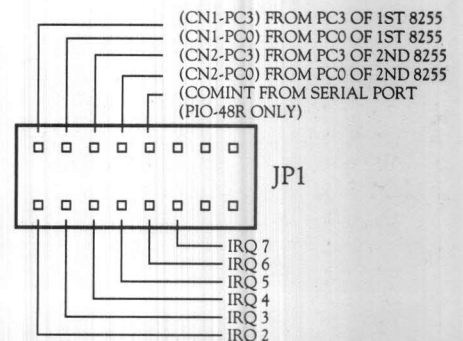
## Programmable Timer (PIO-48C only)

The i8254 programmable interval timer is mounted on the PIO-48C board. It consists of three independent 16-bit counters, each with a count rate of up to 6.0 MHz. Each counter can be programmed for a count from 0 to 65,535. Each counter can also be set for one of six different operating modes, which can each be programmed through software. The counter A2 is fed internally with a pulse equal to 1/2 the CPU clock frequency. The six modes are as follows:

- Mode 0 Interrupt on Terminal Count (event counter)
- Mode 1 Programmable Digital One-Shot
- Mode 2 Programmable Rate Generator
- Mode 3 Square Wave Rate Generator
- Mode 4 Software-Triggered Strobe (real-time clock)
- Mode 5 Hardware-Triggered Strobe (time delay generator)

## Interrupt Signals

The boards can accept up to 4, (5 in case of PIO-48R), external interrupt signals. This is done by connecting the desired signal line to an IRQ level via a jumper on JP1, as shown in the diagram:



3-YEAR  
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## PIO-48 Series

### Interface Connector

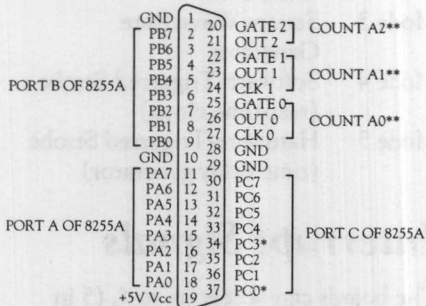
Various connectors are used for external connections to the boards.

### INTERFACE SIGNAL AND PIN ASSIGNMENT

| Signals       | Connectors    | PIO-48W | PIO-48C | PIO-48R |
|---------------|---------------|---------|---------|---------|
| Digital I/O   | 37-pin D-Type | CN1     | CN1     | CN1     |
| Digital I/O   | 30-pin header | CN2     | CN2     | CN3     |
| Timer/counter | 37-pin D-type | —       | CN1     | —       |
| Serial commn. | 26-pin header | —       | —       | CN2     |

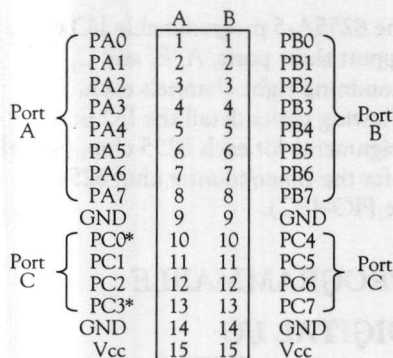
The individual pin assignments are shown in the diagram.

### REAR VIEW OF CN1



\*PC0 AND PC3 CAN BE  
USED AS INTERRUPTS  
\*\*FOR PIO-48C ONLY

### TOP VIEW OF CN2/CN3



\*PC0 AND PC3 CAN BE  
USED AS INTERRUPTS

### PIN ASSIGNMENT OF CN2 (PIO-48R)

| DB-25P PIN NO. | SIGNAL NAME | PIN NUMBER | PIN NUMBER | SIGNAL NAME | DB-25P PIN NO. |
|----------------|-------------|------------|------------|-------------|----------------|
| 1              | N.C.        | A1         | B1         | N.C.        | 14             |
| 2              | TXD         | A2         | B2         | N.C.        | 15             |
| 3              | RXD         | A3         | B3         | N.C.        | 16             |
| 4              | RTS         | A4         | B4         | N.C.        | 17             |
| 5              | CTS         | A5         | B5         | +RCV        | 18             |
| 6              | DSR         | A6         | B6         | N.C.        | 19             |
| 7              | GND         | A7         | B7         | DTR         | 20             |
| 8              | DCD         | A8         | B8         | N.C.        | 21             |
| 9              | +XMIT       | A9         | B9         | RI          | 22             |
| 10             | N.C.        | A10        | B10        | N.C.        | 23             |
| 11             | -XMIT       | A11        | B11        | N.C.        | 24             |
| 12             | N.C.        | A12        | B12        | -RCV        | 25             |
| 13             | N.C.        | A13        | B13        | N.C.        |                |

### Serial Communication

#### (PIO-48R only)

An Asynchronous Communication Element (ACE), NS8250 or equivalent, is mounted on the PIO-48R board for serial communication. This port can be configured as COM1 or COM2 via jumper JP3. A flat ribbon cable with a 26-pin connector and a 25-pin DB connector is included in the package.

### Programming

The PIO-48C interface board lends itself to easy programming with I/O instructions in application language such as BASIC, C, Turbo Pascal. Three modes of operation are supported by the 8255 chip:

|        |                       |
|--------|-----------------------|
| Mode 0 | Basic Input/Output    |
| Mode 1 | Strobed Input/Output  |
| Mode 2 | Bidirectional Bus I/O |

To configure the I/O ports of each 8255, write the appropriate control word to the corresponding control register. The following example shows how to configure the first 8255A-5 chip so that ports PA and PC can be used as input ports and PB as an output port. The control word is 10011001 in binary or 99 Hex.

```

100 BASE=&H500 'set base address
110 OUT BASE +3, &H99 'set
 control word
120 'of 1st 8255
130 DVAL=INP(BASE) 'input
 from PA
140 PRINT DVAL
150 OUT BASE+1,&H05 'turn on
 PB0 and PB2

```

## Accessories

- A. Included with the board
1. D-Connector (loose)
  2. Users manual
  3. Floppy disk containing sample programs
  4. Cable for serial communication (PIO-48R only)

B. Optional – to be ordered extra

### 1180010 DTP-1

Digital terminal panel for PIO Series boards with 36 flat mount terminals.

### 1180020 DTP-2

Digital terminal panel for PIO Series boards with 36 miniature type terminals.

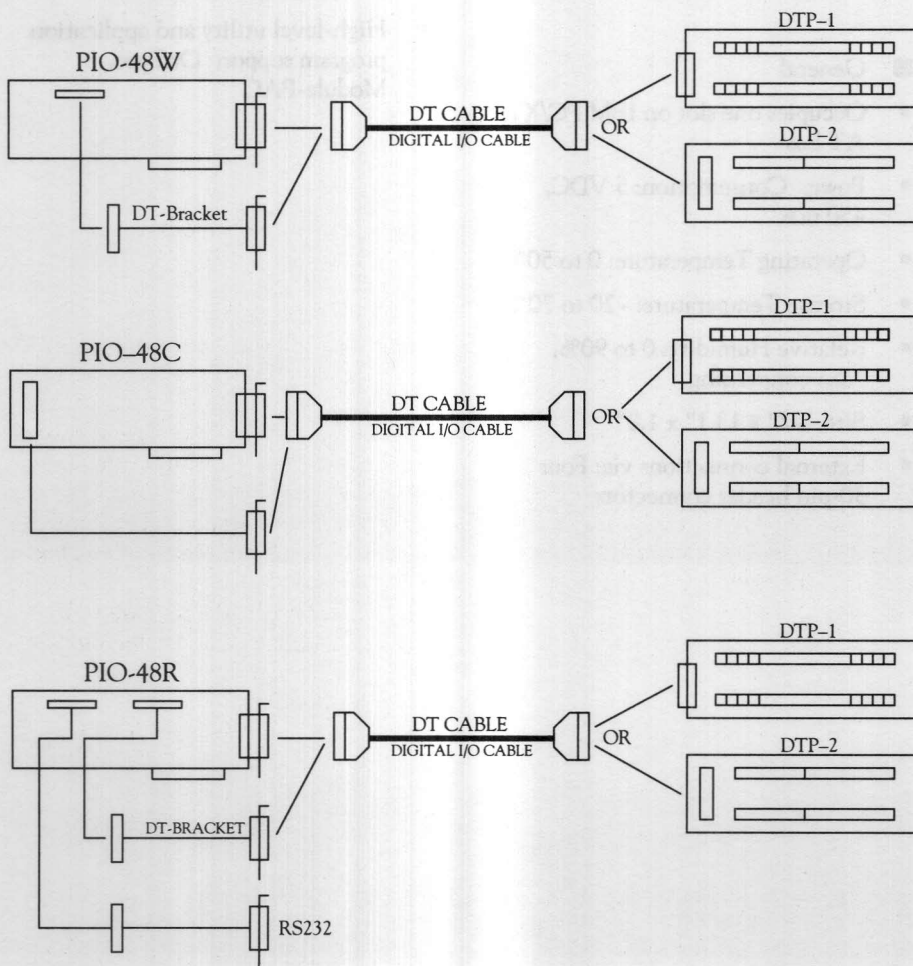
### 1180030 DT-CABLE

Four foot long, 20 twisted pair shielded with two 37-pin male D-type connectors at each end.

### 1180040 DT-Bracket

1 1/2 foot long, flat cable with 37-pin female D-type connector and bracket.

## Product Configuration

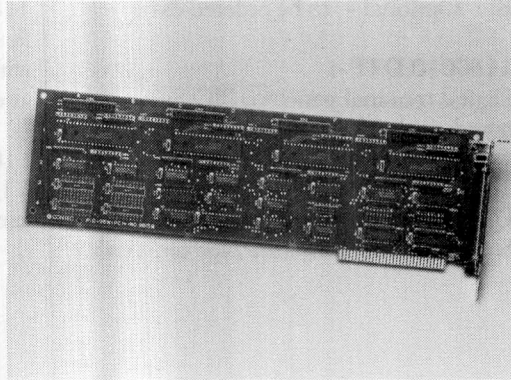




3-YEAR  
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# PIO-96W

## 96-Bidirectional Digital I/O Board



## Specifications

### ■ Digital Input/Outputs

- Number of Channels: 96
- I/O Interface: Four 8255-5 programmable peripheral interface ICs
- Channel Type: Bidirectional
- Input/Output Signal Level: LS-TTL
- Fanout Capacity: 2 LS-TTL loads

### ■ Interrupts: 8

- Address Selection: Any 32-byte boundary

### ■ General

- Occupies one slot on IBM PC/XT/AT bus
- Power Consumption: 5 VDC, 450 mA
- Operating Temperature: 0 to 50°C
- Storage Temperature: -20 to 70°C
- Relative Humidity: 0 to 90%, Non-condensing
- Size: 4.2" x 13.1" x 1.0"
- External connections via: Four 30-pin header connectors

## Features

- Plug-in board for IBM-PC/XT/AT Bus
- 96 bidirectional digital channels
- 8 interrupt signals
- TTL level input/output
- Selectable base address
- Reserved spaces for pull-up or pull-down resistors
- Handshaking
- Sample programs included
- High-level utility and application program support: OnSpec, Module-PAC

## Functional Description

The CONTEC PIO-96W is a ninety-six channel digital bidirectional interface board for data acquisition and control using IBM-PC/XT/AT/compatible computers. Four 8255 parallel I/O Interface ICs provide twelve 8-bit parallel I/O ports. Each bank of eight channels may be configured as either input or output, allowing great flexibility. Eight channels may be used for interrupt signals, which the board can use to drive one interrupt level on the PC BUS. All input/output signals conform to LS-TTL levels, and support pull-up or pull-down resistors if necessary.

## Setting Up Board I/O Address

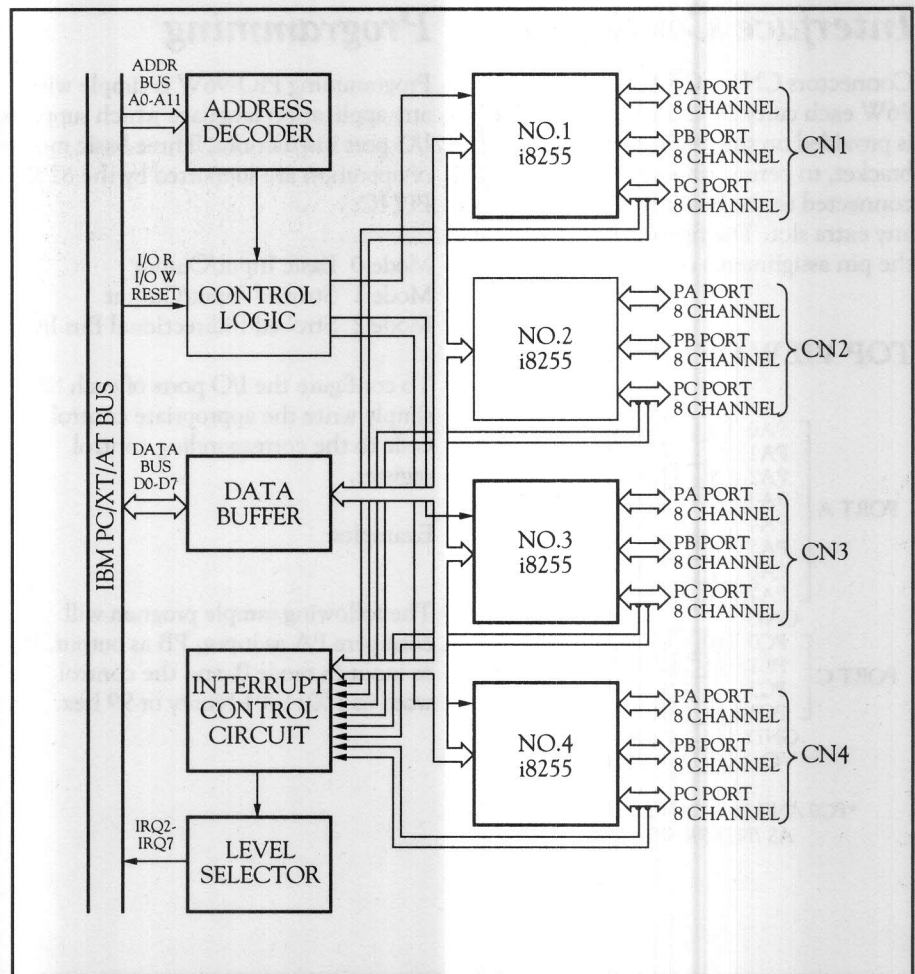
The base address of the PIO-96W can be set using DIP switches. This board requires 32 consecutive addresses. Some addresses are reserved by the IBM-PC and other boards.

## Input/Output Port

The four 8255 programmable I/O chips on the PIO-96W board each support three ports of eight channels, labelled A, B, & C. The following charts show the detailed I/O port assignment on each 8255 chip and the interrupt mask & status register:

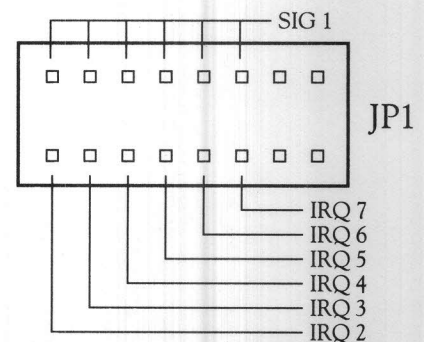
### I/O PORT ASSIGNMENTS

|      | D7                   | D6  | D5  | D4  | D3  | D2  | D1  | D0  |
|------|----------------------|-----|-----|-----|-----|-----|-----|-----|
| + 0H | PORT A OF 8255       |     |     |     |     |     |     |     |
|      | PA7                  | PA6 | PA5 | PA4 | PA3 | PA2 | PA1 | PA0 |
| + 1H | PORT B OF 8255       |     |     |     |     |     |     |     |
|      | PB7                  | PB6 | PB5 | PB4 | PB3 | PB2 | PB1 | PB0 |
| + 2H | PORT C OF 8255       |     |     |     |     |     |     |     |
|      | PC7                  | PC6 | PC5 | PC4 | PC3 | PC2 | PC1 | PC0 |
| + 3H | CONTROL WORD OF 8255 |     |     |     |     |     |     |     |
|      | CW7                  | CW6 | CW5 | CW4 | CW3 | CW2 | CW1 | CW0 |



## Interrupt Jumpers

The PIO-96W interface board can accept up to eight external interrupt signals which are gated into a single IRQ level. To instruct the board which interrupt level to drive, IRQ2 - IRQ7, configure JP1 as shown below:



## PIO-96W

### Interface Connectors

Connectors CN1 – CN4 on the PIO-96W each carry 24 channels. A window is provided on the rear mounting bracket, to permit ribbon cables to be connected to the board without using any extra slot. The figure below shows the pin assignments of CN1 – CN4 :

#### TOP VIEW OF CN1-CN4

|        | A   | B     |     |
|--------|-----|-------|-----|
| PORT A | PA0 | 1 1   | PB0 |
|        | PA1 | 2 2   | PB1 |
|        | PA2 | 3 3   | PB2 |
|        | PA3 | 4 4   | PB3 |
|        | PA4 | 5 5   | PB4 |
|        | PA5 | 6 6   | PB5 |
|        | PA6 | 7 7   | PB6 |
|        | PA7 | 8 8   | PB7 |
| PORT C | GND | 9 9   | GND |
|        | PC0 | 10 10 | PC3 |
|        | PC1 | 11 11 | PC5 |
|        | PC2 | 12 12 | PC6 |
|        | PC3 | 13 13 | PC7 |
|        | GND | 14 14 | GND |
|        | VCC | 15 15 | VCC |
|        |     |       |     |

\*PC0 AND PC3 CAN BE USED  
AS INTERRUPTS

### Programming

Programming PIO-96W is simple with any application language which supports I/O port instructions. Three basic modes of operation are supported by the 8255 PPI IC:

- Mode 0 Basic Input/Output
- Mode 1 Strobed Input/Output
- Mode 2 Strobed Bidirectional Bus I/O

To configure the I/O ports of each 8255, simply write the appropriate control code to the corresponding control register.

Examples:

The following sample program will configure PA as input, PB as output, PC as input in mode 0, and the control word as 10011001 binary or 99 hex.

```

10 BASE = &H500 ' assign the
 base address to a variable
20 NO.8255 = 2 ' write control
 code to the control register of
 the second 8255
30 OUT BASE+(NO.8255-1)*
 4+3, &H99 ' issue control code
40 IN.PA =
 INP(BASE+(NO.8255-1)*4)
 ' input from PA
50 OUT BASE+(NO.8255-1)*
 4+1, IN.PA ' output to PB
60 ' I/O configuration will stay the
 same until the next control
 code is issued

```



## Accessories

- A. Included with the board
  - 1. Users manual
  - 2. Floppy disk containing sample programs
- B. Optional – to be ordered extra

### 1180010 DTP-1

Digital terminal panel for PIO Series boards with 36 flat mount type terminals.

### 1180020 DTP-2

Digital terminal panel for PIO Series boards with 36 miniature type terminals.

### 1180030 DT-Cable

four foot long, 20 twisted pair shielded with 37-pin male D-type connectors at each end.

### 1180040 DT-Bracket

1 1/2 foot long, flat cable with 37-pin female D-type connector and bracket.

### 1180045 DT-Cable/O

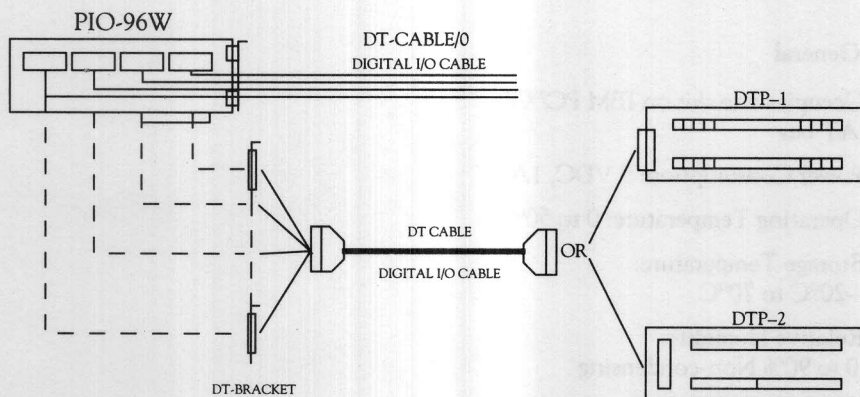
4 foot long, flat ribbon cable with 30-pin connector on the one side and open ended on the other side.

## Application Software

Module-PAC  
Onspec

p.145

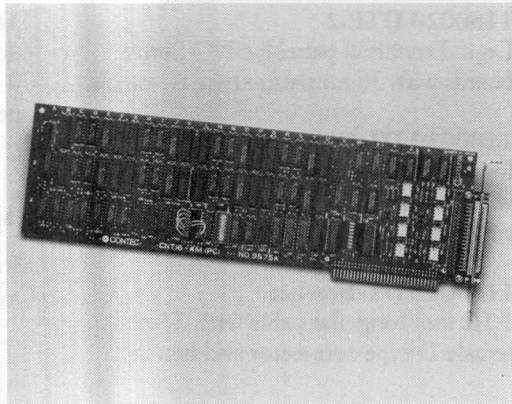
## Product Configuration



3-YEAR  
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# CNT16-4M

## 4 Channel Counter/Timer Board



## Features

- Plug-in board for IBM PC/XT/AT bus
- Four 16-bit counters or two 32-bit counters
- Opto-isolated or TTL-level input
- Up/down binary counting
- Internal 1 MHz frequency source
- Alarm comparators on all counters
- Interrupt handling
- Software drivers included

## Specifications

### ■ Inputs

- No. of Channels:  
Four 16-bit channels or  
two 32-bit channels
- Type: TTL-level; or  
12-24VDC with opto-isolation
- Input Impedance:  
TTL-level input- 2 LS-TTL loads;  
Opto-isolated input - 2 K $\Omega$
- Type of Counting:  
Binary (up and down)
- Internal Frequency Source: 1 MHz

### ■ External Power Supply:

12 - 24 Vdc @ 200 mA  
(opto-isolated input)

### ■ Address Selection:

Any 32 byte boundary

### ■ General

- Occupies one slot on IBM PC/XT/  
AT bus
- Power Consumption: 5 VDC, 1A
- Operating Temperature: 0 to 50°C
- Storage Temperature:  
-20°C to 70°C
- Relative Humidity:  
0 to 90% Non-condensing
- Dimensions: 4.2" x 13.1" x 1.0"
- External Connections via:  
One 37-pin D-connector

## Functional Description

The CONTEC CNT16-4M interface board is an up/down counter that counts digital signals from external devices. This board fits in the expansion slots of IBM-PC/XT/AT and compatibles.

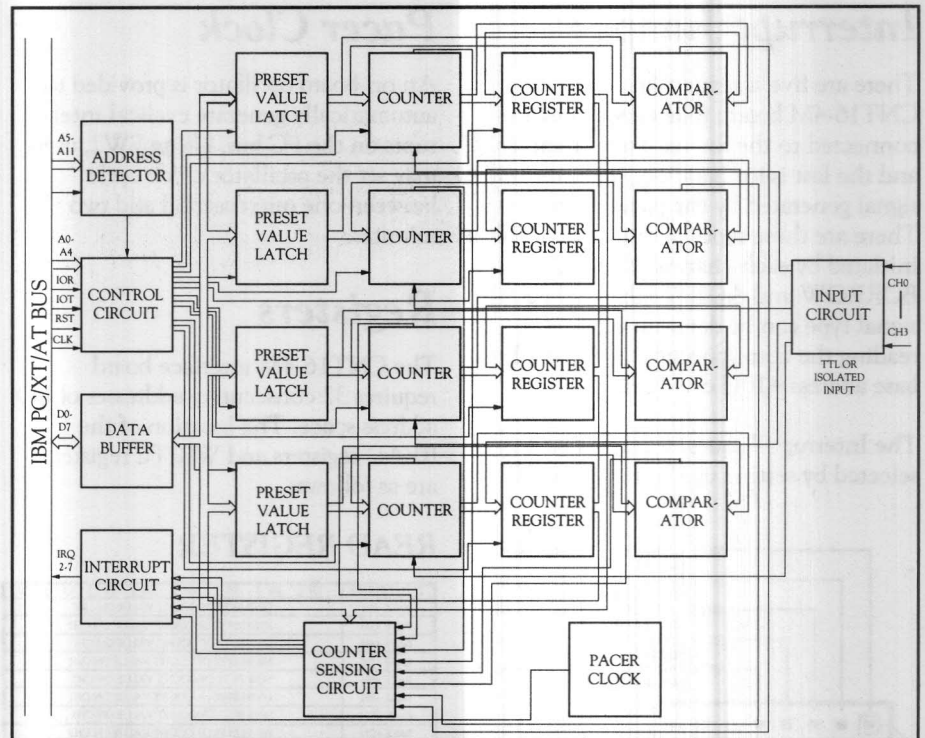
The board can be configured as a 16-bit up/down counter with four channels, or it can be used as a 32-bit up/down counter with two channels. Selection of either of these configurations is accomplished by changing a jumper.

Inputs can be TTL-level or 12-24VDC with opto-isolation. In addition, interrupts may be programmed and used for a variety of conditions. The crystal oscillator is programmable and can be set for clock speeds between one micro-second and two minutes.

Interrupt signals are generated by the board when an overflow occurs during count up, when an underflow occurs during count down, when a count value agrees with preset comparison data, or when initiated by the programmable timer.

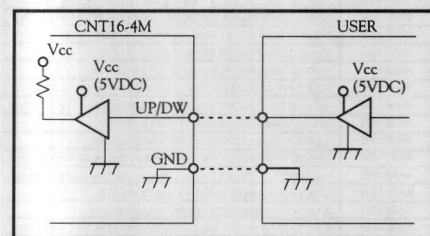
## Setting Up The Base Address

The base address of the CNT16-4M board can be set up by using a DIP switch. Some I/O port addresses have been reserved for the IBM Personal Computer and other boards. Each counter board requires 32 consecutive addresses for its internal use.

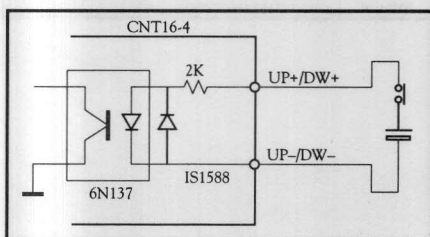


## Input Circuitry

### TTL INPUT



### OPTO-ISOLATED INPUT



## Configuration Selection

Jumpers are provided on-board for selecting the counter configuration and type of inputs.

### 16-bit/32-bit counter selection

The following table shows channel configuration possibilities:

| CHANNEL NUMBER | CONFIGURATIONS |    |     |    |
|----------------|----------------|----|-----|----|
|                | I              | II | III | IV |
| 0              | 16             | 16 | 32  | 32 |
| 1              | 16             | 16 |     |    |
| 2              | 16             | 32 | 16  | 32 |
| 3              | 16             |    | 16  |    |

### Input type

The user can select the type of inputs, in pairs, as opto-coupler-isolated or TTL-level inputs.



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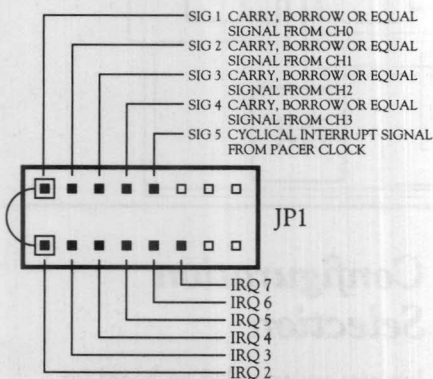
## CNT16-4M

### Interrupt Jumper

There are five interrupt lines on the CNT16-4M board; four signal lines are connected to the four counter channels and the last is for handling the interrupt signal generated by the pacer clock.

There are three types of interrupt signals initiated by each channel: CARRY, BORROW and AGREEMENT. The signal type can be determined by reading the corresponding status word at base address +10H or +11H.

The Interrupt Request level can be selected by setting up the jumper in JP1.



### Status Word

The bits of the status word indicate count up overflows, count down underflows, agreement in compare value for channels 0 and 1 at base address +10H, and for channels 2 and 3 at base address +11H.

### Pacer Clock

An on-board oscillator is provided to automatically generate cyclical interrupts on the PC bus. Using SW2, users may set the oscillator clock cycle between one microsecond and two minutes.

### Registers

The CNT16-4M interface board requires 32 consecutive addresses of I/O address space. The location of the READ registers and WRITE registers are as follows:

#### READ REGISTER

| INPUT PORTS | D7                              | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
|-------------|---------------------------------|----|----|----|----|----|----|----|
| BASE +0H    | LOW BYTE OF COUNT VALUE ON CH0  |    |    |    |    |    |    |    |
| BASE +1H    | HIGH BYTE OF COUNT VALUE ON CH0 |    |    |    |    |    |    |    |
| BASE +4H    | LOW BYTE OF COUNT VALUE ON CH1  |    |    |    |    |    |    |    |
| BASE +5H    | HIGH BYTE OF COUNT VALUE ON CH1 |    |    |    |    |    |    |    |
| BASE +8H    | LOW BYTE OF COUNT VALUE ON CH2  |    |    |    |    |    |    |    |
| BASE +9H    | HIGH BYTE OF COUNT VALUE ON CH2 |    |    |    |    |    |    |    |
| BASE +CH    | LOW BYTE OF COUNT VALUE ON CH3  |    |    |    |    |    |    |    |
| BASE +DH    | HIGH BYTE OF COUNT VALUE ON CH3 |    |    |    |    |    |    |    |
| BASE +10H   | STATUS WORD FOR CH0 AND CH1     |    |    |    |    |    |    |    |
| BASE +11H   | STATUS WORD FOR CH2 AND CH3     |    |    |    |    |    |    |    |

#### WRITE REGISTER

| OUTPUT PORTS | D7                                                   | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
|--------------|------------------------------------------------------|----|----|----|----|----|----|----|
| BASE +0H     | LOW BYTE OF PRESET VALUE OR COMPARISON DATA FOR CH0  |    |    |    |    |    |    |    |
| BASE +1H     | HIGH BYTE OF PRESET VALUE OR COMPARISON DATA FOR CH0 |    |    |    |    |    |    |    |
| BASE +2H     | LOAD COMMAND FOR PRESET VALUE ON CH0                 |    |    |    |    |    |    |    |
| BASE +3H     | LATCH COMMAND FOR COUNT VALUE ON CH0                 |    |    |    |    |    |    |    |
| BASE +4H     | LOW BYTE OF PRESET VALUE OR COMPARISON DATA FOR CH1  |    |    |    |    |    |    |    |
| BASE +5H     | HIGH BYTE OF PRESET VALUE OR COMPARISON DATA FOR CH1 |    |    |    |    |    |    |    |
| BASE +6H     | LOAD COMMAND FOR PRESET VALUE ON CH1                 |    |    |    |    |    |    |    |
| BASE +7H     | LATCH COMMAND FOR COUNT VALUE ON CH1                 |    |    |    |    |    |    |    |
| BASE +8H     | LOW BYTE OF PRESET VALUE OR COMPARISON DATA FOR CH2  |    |    |    |    |    |    |    |
| BASE +9H     | HIGH BYTE OF PRESET VALUE OR COMPARISON DATA FOR CH2 |    |    |    |    |    |    |    |
| BASE +AH     | LOAD COMMAND FOR PRESET VALUE ON CH2                 |    |    |    |    |    |    |    |
| BASE +BH     | LATCH COMMAND FOR COUNT VALUE ON CH2                 |    |    |    |    |    |    |    |
| BASE +CH     | LOW BYTE OF PRESET VALUE OR COMPARISON DATA FOR CH3  |    |    |    |    |    |    |    |
| BASE +DH     | HIGH BYTE OF PRESET VALUE OR COMPARISON DATA FOR CH3 |    |    |    |    |    |    |    |
| BASE +EH     | LOAD COMMAND FOR PRESET VALUE ON CH3                 |    |    |    |    |    |    |    |
| BASE +FH     | LATCH COMMAND FOR COUNT VALUE ON CH3                 |    |    |    |    |    |    |    |
| BASE +10H    | STATUS WORD RESET COMMAND FOR CH0 & CH1              |    |    |    |    |    |    |    |
| BASE +11H    | STATUS WORD RESET COMMAND FOR CH2 & CH3              |    |    |    |    |    |    |    |
| BASE +12H    | COUNT START AND STOP COMMAND                         |    |    |    |    |    |    |    |

### Programming

Programming the CNT16-4M in BASIC is very simple using the software driver delivered with the board. The driver provides interface with IBM interpretive BASIC, GWBASIC, TurboBASIC and Quick BASIC; and it allows the user to start and stop the counter, initialize channels, obtain a counter reading, and implement service routines depending on the desired application. The following is a list of functions supported by the driver:

**INITCNTR:** Initializes all counters

**SETCNTR:** Loads a starting number to a specified counter.

**STARTCNTR:** Starts a counter

**STOPCNTR:** Stops a counter

**READCNTR:** Obtains a counter reading

**CMPCNTR:** Presets comparison data for a specified channel to allow an interrupt signal to be generated when the count matches this data

**RESETSTATUS:** Resets the status word for a specified channel

**READSTATUS:** Returns the status of a channel (overflow, underflow, or comparison value match)

Example: To enable a counter channel and process a service routine when the count matches the pre-loaded number (comparison number).

## Programming (Continued)

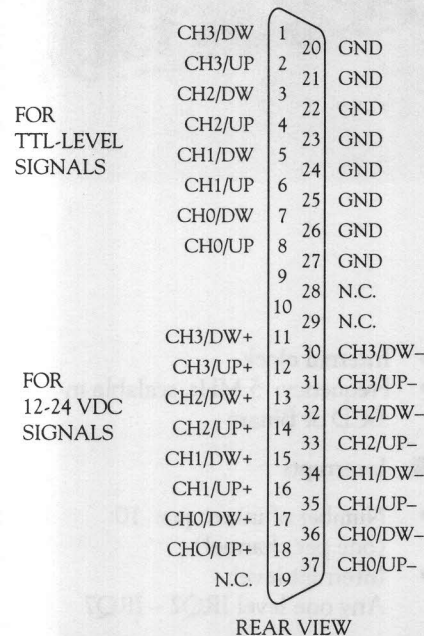
```

500 DEF SEG = DRVSEG
510 CALL INTCNTR ' initialize
 counter
520 CHID = 0 : CVAL# = 5000
530 CALL CMPCNTR (CHID,
 CVAL#) ' load comparison
 value
540 CALL RESETSTATUS
 (CHID) ' reset status word
550 UP = 1 : SW = 0 : MASK = 4
560 CALL STARTCNTR (CHID,
 UP) ' channel 0 as up-counter
570 CALL READSTATUS(CHID,
 SW) ' get status word
590 IF (SW AND MASK) THEN
 GOSUB 1000 ' test agreement
 bit, goto service routine
600 GOTO 570

```

## Interface Connectors

A 37-pin female D-type connector is used on the CNT16-4M interface board. the following diagram shows its pin assignment.



## Accessories

- A. Included with the board
1. D-Connector (loose)
  2. Users Manual
  3. Floppy disk containing software drivers and sample programs

B. Optional – to be ordered extra

### 1180010 DT PANEL DTP-1

Digital terminal panel with 36 flat mount type terminals.

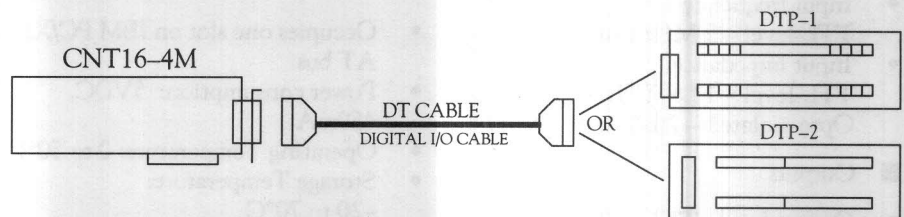
### 1180020 DT PANEL DTP-2

Digital terminal panel with 36 mini-ature type terminals.

### 1180030 DT-CABLE

Four foot long, 40-wire shielded digital terminal cable with two 37-pin male D-type connectors.

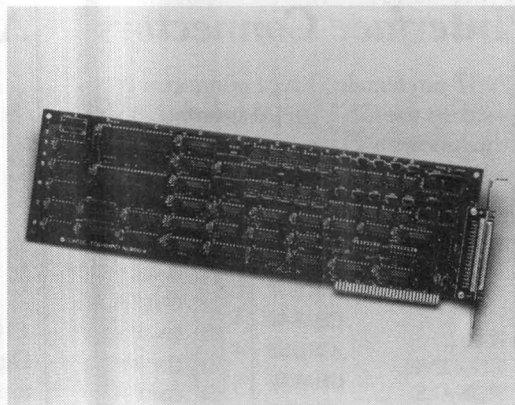
## Product Configuration



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# TCG-10

## 10 Channel Counter/Timer/Pulse Generator Board



## Specifications

### ■ Counters

- Number of counters: 10
- Counter length: 16-bit, (can be configured as two 80-bit counters)
- Counter type: Binary or decimal
- Counting method: up or down
- Functions: counter, timer or pulse generator
- Number of operating modes: 24

### ■ Inputs

- Input level: TTL-5VDC or 12-24VDC with opto-isolation
- Input frequency: TTL-level – 5 MHz max.
- Input impedance: TTL-level – 1 LS-TTL  
Opto-isolated – 2 kohms

### ■ Outputs

- Output level: TTL-5VDC or 12-24VDC with opto-isolation
- Output frequency: TTL-level – 2.5 MHz max.  
Opto-isolated – 250 KHz max.
- Output load: TTL-level – 5VDC, 20mA max.  
Opto-isolated – 35VDC, 20mA max. (open collector output)

- Internal clock
- Frequency: 5 MHz, scalable in BCD or Binary

### ■ Interrupts

- Number of interrupts: 10 (one per channel)
- Interrupt level: Any one level IRQ2 – IRQ7

### ■ Address Selection

- Any 8 byte boundary

### ■ General

- Occupies one slot on IBM PC/XT/AT bus
- Power consumption: 5VDC, 450mA
- Operating Temperature: 0 to 50°C
- Storage Temperature: –20 to 70°C
- Relative Humidity: 0 to 90%, non-condensing
- Dimensions: 4.2" x 13.1" x 1.0"
- External connections via: One 37-pin D-connector

## Features

- Plug-in board for IBM PC/XT/AT bus
- 10 channels can be independently programmed as timers, counters or pulse generators
- Each channel with 16-bit counters and 24 operation modes
- Can generate output pulses based on inputs to counters/timers
- Inputs/outputs TTL-level or opto-isolated 12–24 VDC
- 5 MHz internal clock, scalable in BCD or Binary
- Alarm comparators
- Interrupt handling capability



## Functional Description

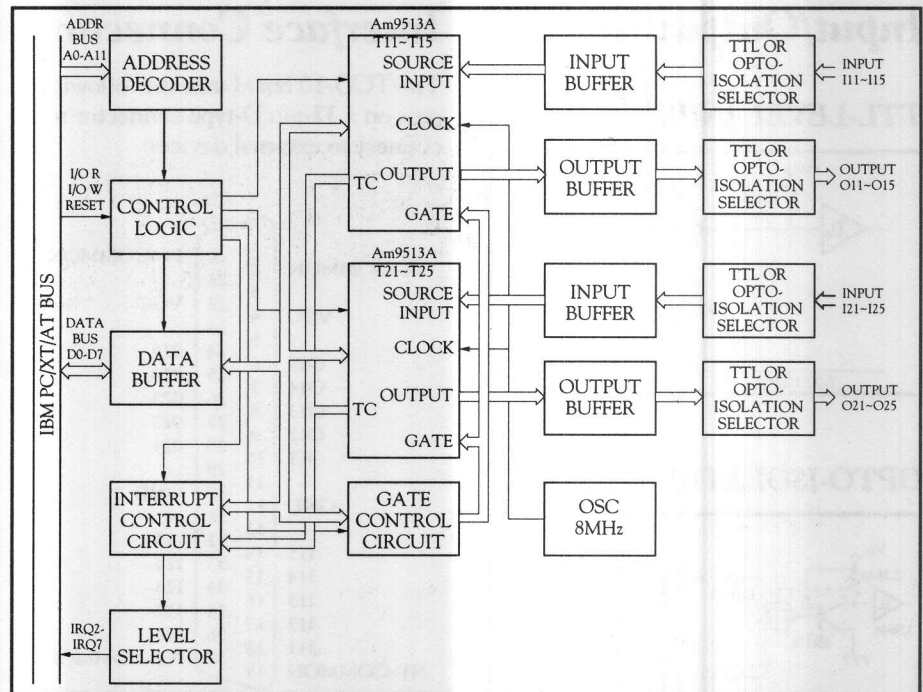
The CONTEC TCG-10 is a programmable timer, counter and pulse generator board for use with IBM-PC/XT/AT and compatible computers. The board contains two LSI timer/counter devices, each of which provide five 16-bit counters. Up to five counters may be linked to create a larger counter of 80 bits. Four counters have comparator circuits to check the count against preset values.

The TCG-10 board accepts either TTL-level or 12–24 VDC input signals with opto-isolation to all counters. An internal 5 MHz clock or an external clock of up to 5 MHz may be divided by five pre-determined BCD or binary values. The board can drive output signals from each counter at either LS-TTL levels or 12–24 VDC through an opto-coupler.

The TCG-10 board provides up to 10 interrupts on any one interrupt level IRQ2-IRQ7. Counter/timer functions such as end of count may be used to generate an interrupt signal. By polling for interrupts, one interrupt level may be shared between multiple boards.

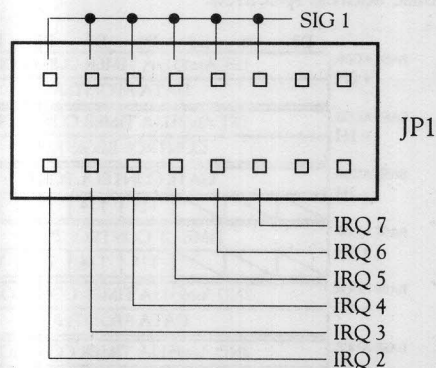
## Setting Board I/O Address

The base address of the TCG-10 is set using DIP switches SW1 and SW2.



## Interrupt Signals

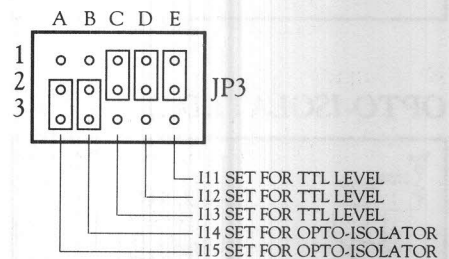
This board generates one interrupt signal. The illustration below shows how to select the interrupt level.



## Input/Output

Jumpers are provided on board for selecting the input and output level. Each channel can be set individually.

For example, the illustration below shows input channels I11–I13 set for TTL level and I14–I15 set for opto-isolator inputs:

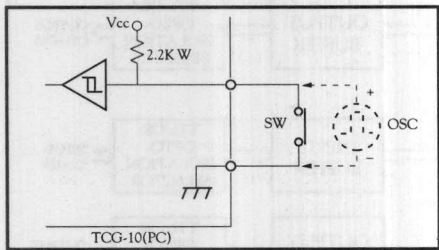




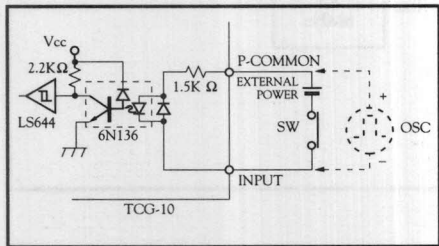
# TCG-10

## Input/Output (continued)

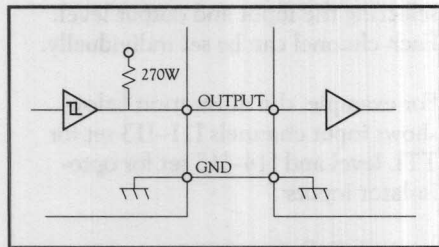
### TTL-LEVEL INPUT



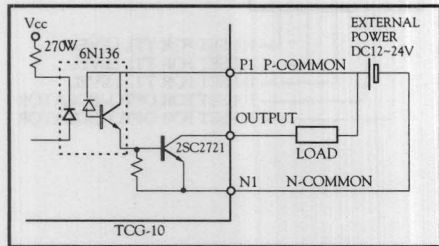
### OPTO-ISOLATED INPUT



### TTL-LEVEL OUTPUT



### OPTO-ISOLATED OUTPUT



## Interface Connector

The TCG-10 board uses the following pins on a 37-pin D-type connector to connect to external devices:

|           |    |    |           |
|-----------|----|----|-----------|
| P1-COMMON | 1  | 20 | P2-COMMON |
|           | 2  | 21 |           |
|           | 3  | 22 |           |
| VCC       | 4  | 23 | VCC       |
|           | 5  | 24 |           |
| O15       | 6  | 25 | O25       |
| O14       | 7  | 26 | O24       |
| O13       | 8  | 27 | O23       |
| O12       | 9  | 28 | O22       |
| O11       | 10 | 29 | O21       |
|           | 11 | 30 |           |
| GND       | 12 | 31 | GND       |
|           | 13 | 32 |           |
|           | 14 | 33 | I25       |
| I15       | 15 | 34 | I24       |
| I14       | 16 | 35 | I23       |
| I13       | 17 | 36 | I22       |
| I12       | 18 | 37 | I21       |
| N1-COMMON | 19 |    | N2-COMMON |

## I/O Registers

The following diagrams show the port address assignments for registers on this board. Please note that the actual location is at the address shown plus the base address specified.

|                 | D7                        | D6 | D5 | D4 | D3              | D2 | D1 | D0 |                                |
|-----------------|---------------------------|----|----|----|-----------------|----|----|----|--------------------------------|
| BASE ADDR. + 0H | 1ST Am9513A TIMER CONTROL |    |    |    |                 |    |    |    | 1ST LSI CONTROL PORT (T11-T15) |
|                 | DATA REGISTER             |    |    |    |                 |    |    |    |                                |
| BASE ADDR. + 1H | CONTROL REGISTER          |    |    |    |                 |    |    |    |                                |
| BASE ADDR. + 2H | GATE CONTROL PORT         |    |    |    |                 |    |    |    | 1ST LSI CONTROL PORT (T11-T15) |
|                 | T15                       |    |    |    | T14 T13 T12 T11 |    |    |    |                                |
| BASE ADDR. + 3H | TIME-UP CONTROL PORT      |    |    |    |                 |    |    |    |                                |
|                 | T15                       |    |    |    | T14 T13 T12 T11 |    |    |    | 2ND LSI CONTROL PORT (T21-T25) |
| BASE ADDR. + 4H | 2ND Am9513A TIMER CONTROL |    |    |    |                 |    |    |    |                                |
|                 | DATA REGISTER             |    |    |    |                 |    |    |    |                                |
| BASE ADDR. + 5H | 2ND Am9513A TIMER CONTROL |    |    |    |                 |    |    |    | 2ND LSI CONTROL PORT (T21-T25) |
|                 | CONTROL REGISTER          |    |    |    |                 |    |    |    |                                |
| BASE ADDR. + 6H | GATE CONTROL PORT         |    |    |    |                 |    |    |    |                                |
|                 | T25                       |    |    |    | T24 T23 T22 T21 |    |    |    | 2ND LSI CONTROL PORT (T21-T25) |
| BASE ADDR. + 7H | TIME-UP CONTROL PORT      |    |    |    |                 |    |    |    |                                |
|                 | T25                       |    |    |    | T24 T23 T22 T21 |    |    |    |                                |

## Software

The TCG-10 board is supplied with an assembly driver for IBM interpretive BASIC, GWBASIC, Quick BASIC and Turbo BASIC. The driver program TCGDRV.EXE is loaded before running the application program.

The TCG10 driver program provides 14 functions to perform various operations such as precision timing, event counting, pulse/frequency measurement and generation.

The following is list of functions supported by the driver:

**TMSS.V** Reports time until a preset count is reached

**TMSS.P** Executes a preloaded sub-routine when the timecount is reached

**TMSR.** Reports time continuously

**TMSR.** Executes a preloaded sub-routine periodically

**CNSS.** Counts the number of pulse inputs until a preset number is reached

**CNSS.P** Executes a preloaded program when the pulse input reaches a predefined number

**CNSR.V** Counts external pulse input continuously

**CNSR.P** Executes a preloaded program whenever a predefined number of pulse input is reached

**CLSS.V** Measures the pulse width and frequency

**CLSR.V** Measures the pulse width and frequency continuously

**CGSR** Generates a pulse stream at the specified frequency

**CDSR** Outputs a pulse stream at a frequency determined by dividing an input frequency with a specified scale

**C.RESET** Stops the continuous operation dedicated to a particular counter

**INITIAL** Initializes the system

## Accessories

- A. Included with the board
  1. D-Connector (loose)
  2. Users Manual
  3. Floppy disk containing software drivers and sample programmes
- B. Optional – to be ordered extra

### 1180010DT Panel DTP-1

Digital terminal panel with 36 flat mount type terminals.

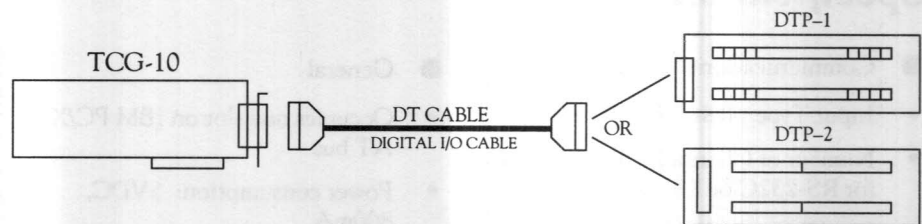
### 1180020 DT Panel DTP-2

Digital terminal panel with 36 miniature type terminals.

### 1180030 DT-Cable

Four foot long, 40-wire shielded digital terminal cable with two 37-pin male D-type connectors.

## Product Configuration

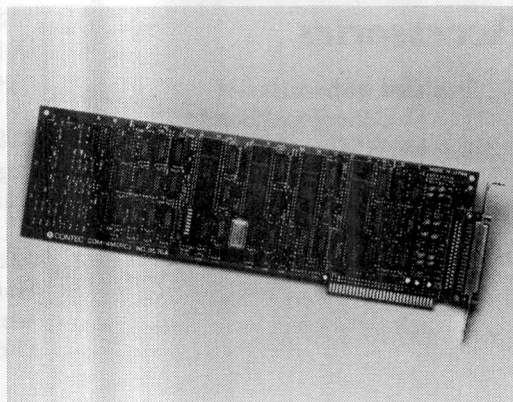




3-YEAR  
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# COM-4M

## 4-Channel RS232C/RS422 Serial Communication Board



## Specifications

### ■ Communication

- Input Type: RS-232C or RS-422
- Number of Channels: 4, selectable for RS-232C or RS-422 in pairs
- Baud Rate: 75 – 56,000 bps
- Data Buffer: 1 character, transmitter & receiver
- Data Word Length: 5, 6, 7 or 8 bits
- Stop Bits: 1, 1.5 or 2 bits
- Parity: Even, Odd, or None
- Mode: Compatible or enhanced
- COM1 and COM2: In compatible mode
- UART IC: NS16540

### ■ I/O Port Addresses

- 33 bytes predetermined

### ■ General

- Occupies one slot on IBM PC/XT/AT bus
- Power consumption: 5VDC, 800mA
- Operating Temperature: 0 to 50°C
- Storage Temperature: -20 to 70°C
- Relative Humidity: 0 to 90%, non-condensing
- Dimensions: 4.2" x 13.1" x 1.0"
- External connections: RSC-232C via one 37-pin D-connector  
RSC-422 via two 40-pin header connectors

## Features

- Plug-in board for IBM PC/XT/AT bus
- RS-232C or RS-422 communication
- Data rates 75 – 56,000 bps
- Operates in compatible or enhanced mode
- Can be set for COM1 and COM2 in compatible mode
- Programmable start/stop bits
- Interrupt handling capability
- Software programmable

## Functional Description

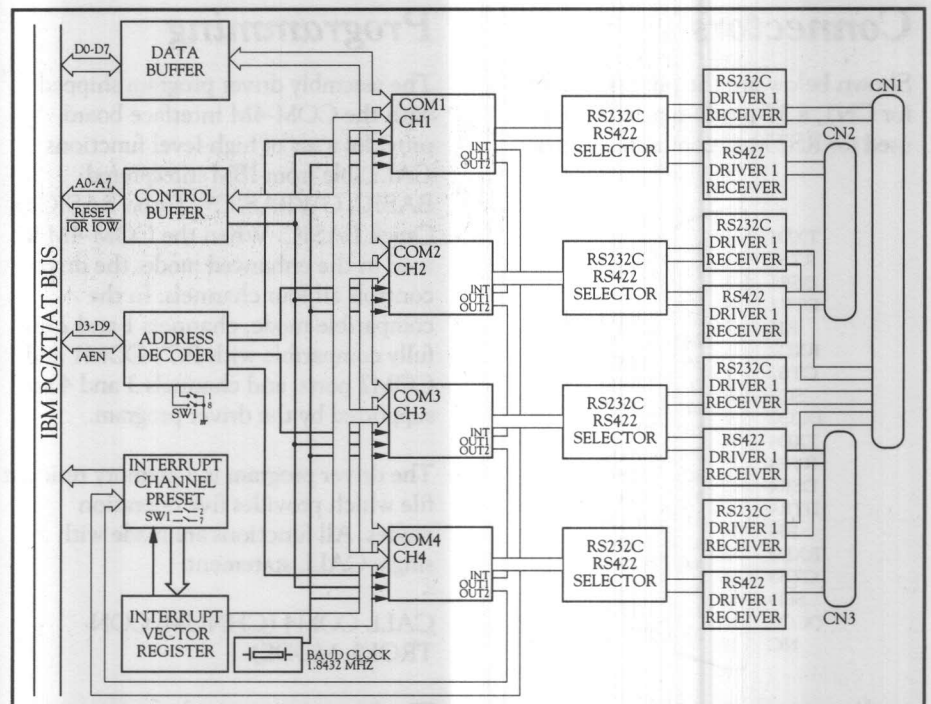
The CONTEC COM-4M is a general purpose asynchronous communications board. It provides four serial ports, each conforming to RS-232C and RS-422 standards. Four NS16450 ICs control the ports. User configurable features include programmable baud rates from 75 to 56,000 bps; DIP-switch selectable interrupt; enhanced and compatible operation modes; 5, 6, 7 or 8-bit words; and programmable start/stop bits. A 37-pin D-type connector supports all four channels of RS-232C communications, while two 40-pin connectors support two channels each of RS-422 communications.

## Mode, I/O Addresses, & Interrupts

Operation mode, I/O addresses and interrupt request line are all handled by setting DIP-switch SW1. Bit 1 selects compatible or enhanced mode; bits 2 – 7 set interrupt signals, and bit 8 sets the address range in conjunction with the chosen mode. The chart at right shows how to set SW1:

## Input Settings

Configuring the four data channels for RS-232C or RS-422 communications standards is done via on-board jumpers. They can be selected in pairs.



| Mode       | SW1   |       | I/O Port Addresses |         |         |         | Interrupt Vector |
|------------|-------|-------|--------------------|---------|---------|---------|------------------|
|            | Bit 1 | Bit 8 | Ch. 1              | Ch. 2   | Ch. 3   | Ch. 4   |                  |
| Enhanced   | OFF   | ON    | 2A0-2A7            | 2A8-2AF | 2B0-2B7 | 2B8-2BE | 2BF              |
| Enhanced   | OFF   | OFF   | 1A0-1A7            | 1A8-1AF | 1B0-1B7 | 1B8-1BE | 1BF              |
| Compatible | ON    | ON    | 3F8-3FF            | 2F8-2FF | 2B0-2B7 | 2B8-2BE | 2BF              |
| Compatible | ON    | OFF   | 3F8-3FF            | 2F8-2FF | 1B0-1B7 | 1B8-1BE | 1BF              |

## I/O Ports and Registers

Offset addresses 0 – 7, when applied to the address range of each channel, allow access to the internal registers of the four ACE ICs. The functions of the eight registers are shown at right:

| I/O PORT ADDRESS | DLAB | ACE REGISTERS (INS8250-B OR NS16450) | NOTE |
|------------------|------|--------------------------------------|------|
| +0H              | 0    | RECEIVER (HOLDING REGISTER)          | R    |
| +0H              | 0    | TRANSMITTER (HOLDING REGISTER)       | W    |
| +1H              | 0    | INTERRUPT MASK                       |      |
| +2H              | X    | INTERRUPT ID                         |      |
| +3H              | X    | LINE CONTROL                         |      |
| +4H              | X    | MODEM CONTROL                        |      |
| +5H              | X    | LINE STATUS                          | R    |
| +6H              | X    | MODEM STATUS                         | R    |
| +7H              | X    | SCRATCH PAD                          |      |
| +0H              | 1    | BAUD RATE DIVIDER REGISTER LSB       |      |
| +1H              | 1    | BAUD RATE DIVIDER REGISTER MSB       |      |

R = READ ONLY, W = WRITE ONLY,  
DLAB = DIVISOR LATCH ACCESS BIT

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## COM-4M

### Connectors

Shown below are the pin assignments for CN1, a 37-pin D-type connector used for RS232-C communications:

|      |    |    |          |
|------|----|----|----------|
| TXD1 | 1  | 20 | RXD1     |
| RTS1 | 2  | 21 | CTS1     |
| DSR1 | 3  | 22 | SG1      |
| DTR1 | 4  | 23 | DETECT 1 |
| RI1  | 5  | 24 | TXD2     |
| RXD2 | 6  | 25 | RTS2     |
| CTS2 | 7  | 26 | DSR2     |
| SG2  | 8  | 27 | DTR2     |
| DCO2 | 9  | 28 | RI2      |
| TXD4 | 10 | 29 | RXD4     |
| RTS4 | 11 | 30 | CTS4     |
| DSR4 | 12 | 31 | SG4      |
| DTR4 | 13 | 32 | DCO4     |
| RI4  | 14 | 33 | TXD3     |
| RXD3 | 15 | 34 | RTS3     |
| CTS3 | 16 | 35 | DSR3     |
| SG3  | 17 | 36 | DTR3     |
| DCO3 | 18 | 37 | RI3      |
| NC   | 19 |    |          |

Shown below are the pin assignments for the CN2 and CN3, 40-pin connectors used for RS-422 communications. The assignments for CN3 are shown in parenthesis following those for CN2.

|            | PIN NO. |    |            |
|------------|---------|----|------------|
| +SOUT 1(3) | 1       | 21 | -SOUT 1(3) |
| +SIN 1(3)  | 2       | 22 | -SIN 1(3)  |
| +RTS 1(3)  | 3       | 23 | -RTS 1(3)  |
| +CTS 1(3)  | 4       | 24 | -CTS 1(3)  |
| +DTR 1(3)  | 5       | 25 | -DTR 1(3)  |
| +DSR 1(3)  | 6       | 26 | -DSR 1(3)  |
| +DCD 1(3)  | 7       | 27 | -DCD 1(3)  |
| +RI 1(3)   | 8       | 28 | -RI 1(3)   |
| +SG 1(3)   | 9       | 29 | FG         |
| NC         | 10      | 30 | NC         |
| +SOUT 2(4) | 11      | 31 | -SOUT 2(4) |
| +SIN 2(4)  | 12      | 32 | -SIN 2(4)  |
| +RTS 2(4)  | 13      | 33 | -RTS 2(4)  |
| +CTS 2(4)  | 14      | 34 | -CTS 2(4)  |
| +DTR 2(4)  | 15      | 35 | -DTR 2(4)  |
| +DSR 2(4)  | 16      | 36 | -DSR 2(4)  |
| +DCD 2(4)  | 17      | 37 | -DCD 2(4)  |
| +RI 2(4)   | 18      | 38 | -RI 2(4)   |
| +SG 2(4)   | 19      | 39 | FG         |
| NC         | 20      | 40 | NC         |

### Programming

The assembly driver program shipped with the COM-4M interface board provides a set of high level functions CALLable from IBM interpreted BASIC, GWBASIC\*, Turbo BASIC or Quick BASIC. When the COM-4M is used in the enhanced mode, the driver controls all four channels. In the compatible mode, channels 1 and 2 are fully compatible with PC's COM1 and COM2 ports, and channels 3 and 4 are supported by the driver program.

The driver program is a memory resident file which provides five operation modes. All functions are made with a single CALL statement:

CALL COM4 (CHNUM, CONTROL\$, MODE)

The five operation modes are:

- 1 - Opens a serial port and specifies the communication parameters.
- 2 - Receives input from a selected channel.
- 3 - Sends data to a defined channel.
- 4 - Closes an open channel.
- 5 - Reports the number of bytes in the buffer to be transferred.

#### Programming Example:

```

10 DEFINT A-Z ' Initialize function
 call
20 DEF SEF = 0
30 COM4 =
 PEEK(&H4E8)+256*PEEK(&H4E9)
40 COMSEG =
 PEEK(&H4EA)+256*PEEK(&H4EB)
50 DEF SEG = COMSEF ' Define
 constant
60 COMOPEN = 1: COMINPUT = 2:
 COMOUT = 3

```

\*version 4.0

```

70 COMCLOSE = 4: COMLOC = 5
80 ' Use channel 3 in Compatible
 mode
90 CHANNEL = 11' Open channel
100 OPENMODES = "9600,e,8,1,
 ,cs1000,ds1000"
110 CALL COM4 (CHANNEL,
 OPENMODE$,COMOPEN)
120 MESSAGE$ = "Hello there!"
130 CALL COM4 (CHANNEL,
 MESSAGE$,COMOUT)
 'Send a file
140 RECBUF$ = SPACE$(225)
150 CALL COM4 (CHANNEL,
 RECBUF$,COMINPUT)
 'Receive a file
160 PRINT RECBUF$
170 END

```

### Accessories

- A. Included with the board
  1. D-Connector (loose)
  2. Users Manual
  3. Floppy disk containing software drivers and sample programmes
- B. Optional - to be ordered extra

#### 1380015 RS-422 Cable

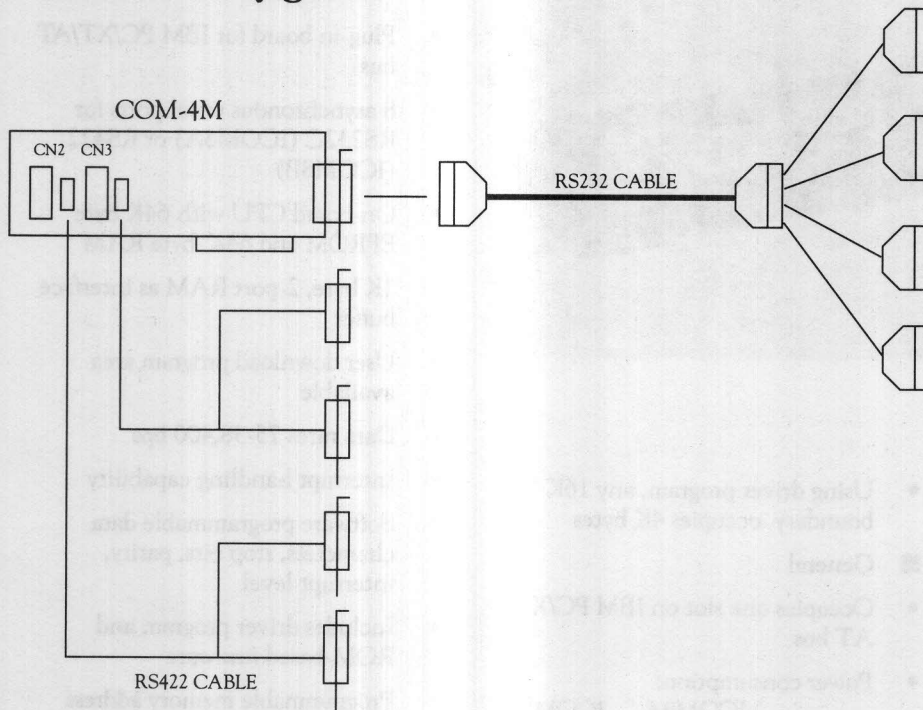
40-pin header connector at one end and two 25-pin D-connectors with mounting brackets at the other end. One cable for 2 RS422 channels.

#### 1380016 RS-232 Cable

37-pin male D-connector at one end and four 25-pin D-connectors at the other end.



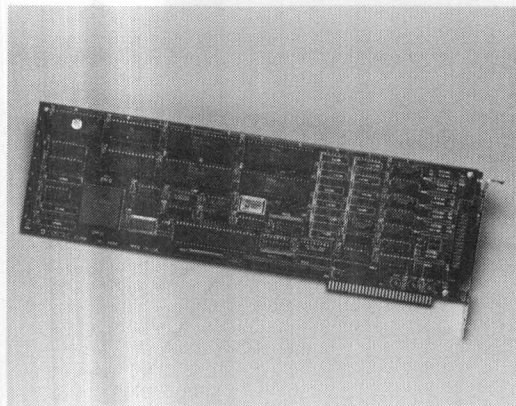
## Product Configuration



3-YEAR  
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# ICOM8A/ICOM8B

8 Channel  
Intelligent  
RS232/RS422  
Communication  
Boards



## Specifications

### ■ Communication

- Input Type: ICOM8A – RS232C  
ICOM8B – RS422
- Number of Channels: 8 channels
- Baud Rate: 75 – 38,400 bps
- Data Buffer: 1K bytes, 2-port RAM supported by firmware
- Data Word Length: 5, 6, 7, or 8 bits
- CPU: i80188, 10MHz + 64K byte RAM + 64K byte EPROM
- Stop Bits: 1, 1.5 or 2 bits
- Parity: Even, Odd or None
- UART IC: Z85C30

### ■ Interrupt Signals

Any one level IRQ2 – IRQ7

### ■ Addresses

- 2-port RAM address selection

- Using driver program, any 16K boundary, occupies 4K bytes

### ■ General

- Occupies one slot on IBM PC/XT/AT bus

- Power consumption:

|         | ICOM8A      | ICOM8B      |
|---------|-------------|-------------|
| +5V DC  | 1200 mA max | 1600 mA max |
| +12V DC | 60 mA max   | —           |
| -12V DC | 40 mA max   | —           |

- Operating Temperature: 0 to 50°C
- Storage Temperature: -20 to 70°C
- Relative Humidity: 0 to 90%, non-condensing
- Dimensions: 4.2" X 13.1" X 1.0
- External Connections: One 68-pin common connector

## Features

- Plug-in board for IBM PC/XT/AT bus
- 8 asynchronous serial ports for RS232C (ICOM8A) or RS422 (ICOM8B)
- On-board CPU with 64K byte EPROM and 64K byte RAM
- 1K byte, 2-port RAM as interface buffer
- User download program area available
- Data rates 75-38,400 bps
- Interrupt handling capability
- Software programmable data characters, stop bits, parity, interrupt level
- Includes driver program and ROM-based firmware
- Programmable memory address mapping

## Functional Description

The CONTEC ICOM8 is a general purpose intelligent asynchronous communication board with eight ports. ICOM8A is designed for RS232C and ICOM8B for RS-422 communications. Four Z85C30 ICs control the ports. The i80188 CPU works with the firmware to transmit and receive data between the host and external equipment, so that the user may treat up to 256/640 data bytes in one transaction, thereby increasing the system's speed. Using the driver program, which is included with each board, the user may command communication settings as well as user program downloading.

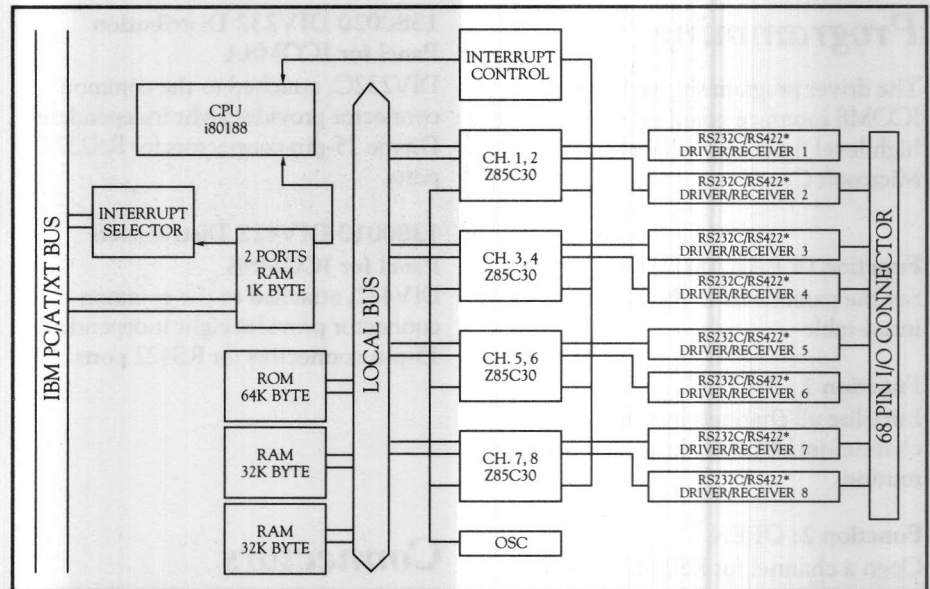
One 68-pin common connector provides all signals for 8 ports. An optional divider box, DIV232C, attached to the common connector provides eight independent D-type, 25-pin connectors for the RS232C, while optional divider box, DIV422, attached to the common connector, provides eight independent, D-type, 15-pin connectors for RS422 communications.

## Memory Addresses & Interrupts

Memory addresses are set by a DIP-switch. Interrupt request line is handled by one driver program.

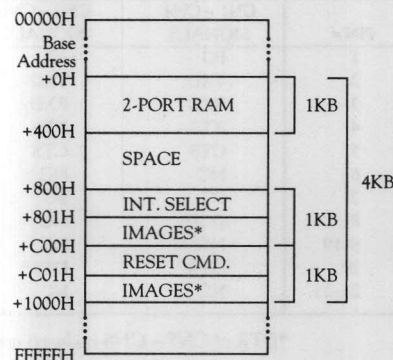
## Interface Memory

1024 bytes of 2-port RAM can be used for read/write from both the host and the on-board CPU i80188 at any time. Base address is set by dip switch.



\*ICOM8A - RS232C  
\*ICOM8B - RS422

## 2-PORT RAM ADDRESS LOCATION IN SYSTEM BUS



\*NOTE: It is not recommended to read/write the Images areas.

## Connectors

Shown below are the separate pin assignments used on the CN1, a 68-pin D-type connector, for RS232C and RS422 communications. The following diagram shows the pin assignment for the CN1 on the board.

| Pin # | Signals         |                 | Pin # | Signals         |                 |
|-------|-----------------|-----------------|-------|-----------------|-----------------|
|       | ICOM8A (RS232C) | ICOM8A (RS422C) |       | ICOM8A (RS232C) | ICOM8A (RS422C) |
| L1    | TXD1            | TXD+1           | R1    | TXD5            | TXD+4           |
| L2    | RXD1            | TXD-1           | R2    | RXD5            | TXD-4           |
| L3    | RTS1            | RXD+1           | R3    | RTS5            | RXD+4           |
| L4    | CTS1            | RXD-1           | R4    | CTS5            | RXD-4           |
| L5    | DTR1            | RTS+1           | R5    | NC              | RTS+4           |
| L6    | DCD1            | RTS-1           | R6    | NC              | RTS-4           |
| L7    | SG              | SG              | R7    | SG              | SG              |
| L8    | SG              | SG              | R8    | SG              | SG              |
| L9    | TXD2            | CTS+1           | R9    | TXD6            | CTS+4           |
| L10   | RXD2            | CTS-1           | R10   | RXD6            | CTS-4           |
| L11   | RTS2            | TXD+2           | R11   | RTS6            | TXD+5           |
| L12   | CTS2            | TXD-2           | R12   | CTS2            | TXD-5           |
| L13   | DTR2            | RXD+2           | R13   | NC              | RXD+5           |
| L14   | DCD2            | RXD-2           | R14   | NC              | RXD-2           |
| L15   | SG              | SG              | R15   | SG              | SG              |
| L16   | SG              | SG              | R16   | SG              | SG              |
| L17   | TXD3            | RTS+2           | R17   | TXD7            | TXD+6           |
| L18   | RXD3            | RTS-2           | R18   | RXD7            | TXD-6           |
| L19   | RTS3            | CTS+2           | R19   | RTS7            | RXD+6           |
| L20   | CTS3            | CTS-2           | R20   | CTS3            | RXD-6           |
| L21   | DTR3            | TXD+3           | R21   | NC              | TXD+7           |
| L22   | DCD3            | TXD-3           | R22   | NC              | TXD-7           |
| L23   | SG              | SG              | R23   | SG              | SG              |
| L24   | SG              | SG              | R24   | SG              | SG              |
| L25   | TXD4            | RXD+3           | R25   | TXD8            | RXD+7           |
| L26   | RXD4            | RXD-3           | R26   | RXD8            | RXD-7           |
| L27   | RTS4            | RTS+3           | R27   | RTS8            | TXD+8           |
| L28   | CTS4            | RTS-3           | R28   | CTS8            | TXD-8           |
| L29   | DTR4            | CTS+3           | R29   | +12V            | RXD+8           |
| L30   | DCD4            | CTS-3           | R30   | +12V            | RXD-8           |
| L31   | NC              | NC              | R31   | NC              | NC              |
| L32   | NC              | NC              | R32   | NC              | NC              |
| L33   | NC              | NC              | R33   | NC              | NC              |
| L34   | NC              | NC              | R34   | NC              | NC              |



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## ICOM8A/ICOM8B

### Programming

The driver program shipped with the ICOM8 interface board provides a set of high level functions callable from Microsoft C.

#### Function 0: PARAMETER SET

Set the parameters to the channel-initial-table

#### Function 1: INTIAL

Initialize all channels by using the channel-initial-table. Load the interrupt routine

#### Function 2: OPEN

Open a channel for RS232C/RS422 communication

#### Function 3: CLOSE

Close (disable) an opened channel

#### Function 4: SEND

Output data via the selected channel

#### Function 5: RECEIVE

Input data from all channels

### Accessories

#### A. Included with the board

1. Diskette with driver and sample programs
2. Users Manual

#### B. Optional - to be ordered extra:

#### 1380020 DIV232 Distribution Panel for ICOM8A

DIV232C, attached to the common connector provides eight independent, D-type 25-pin connectors for RS232C ports.

#### 1380010 DIV422 Distribution Panel for ICOM8B

DIV422, attached to the common connector provides eight independent, 15-pin connectors for RS422 ports.

#### 2180020 MT/68 Cable

A 4 foot, flat cable with 68-pin male I/O connectors at either end.

#### 2180010 MT/S Cable

A 4 foot shielded cable with 68-pin male I/O connectors at either end.

### Connectors

The following diagram shows the pin assignment for the CN1 to CN8 of DIV232

#### DIV232

| PIN # | CN1 - CN4 SIGNALS | CN5 - CN8 SIGNALS |
|-------|-------------------|-------------------|
| 1     | FG                | FG                |
| 2     | TXD               | TXD               |
| 3     | RXD               | RXD               |
| 4     | RTS               | RTS               |
| 5     | CTS               | CTS               |
| 6     | NC                | NC                |
| 7     | SG                | SG                |
| 8     | DCD               | NC                |
| 9-19  | NC                | NC                |
| 20    | DTR               | DTR*              |
| 21-25 | NC                | NC                |

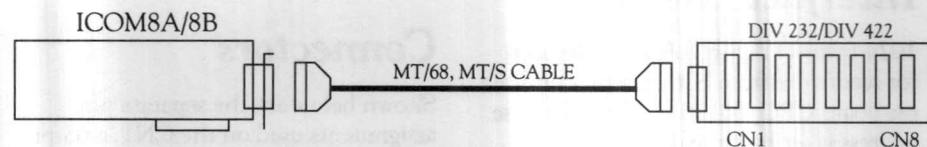
\*DTR of CN5 - CN8 is always active

The following diagram shows the pin assignment for the CN1 to CN8 of DIV422

#### DIV422

| PIN # | CN1 - CN4 SIGNALS | CN5 - CN8 SIGNALS |
|-------|-------------------|-------------------|
| 1     | TXD+              | TXD+              |
| 2     | RXD+              | RXD+              |
| 3     | RTS+              | NC                |
| 4     | CTS+              | NC                |
| 5     | SG                | SG                |
| 6-8   | NC                | NC                |
| 9     | TXD-              | TXD-              |
| 10    | RXD-              | RXD-              |
| 11    | RTS-              | NC                |
| 12    | CTS-              | NC                |
| 13    | FG                | FG                |
| 14    | NC                | NC                |
| 15    | NC                | NC                |

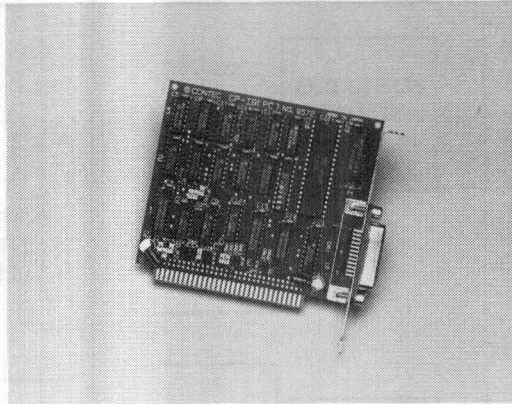
### Product Configuration



ICOM8A - DIV232 = 8 - 25-pin D-connectors  
ICOM8B - DIV422 = 8 - 15-pin D-connectors

# GPIB

## IEEE-488 Interface Board



## Specifications

- Data Transfer Speed
  - Normal: 20 Kbytes/sec.
  - DMA mode: up to 300 Kbytes/sec.
- DMA
  - Number of channels: 3
  - Selection: via on board jumper
- Interrupts
  - Interrupt Level: Any one from IRQ2 to IRQ7
  - Interrupt acknowledge: Any one from INT ACK2 to INT ACK7
  - Selection: individually via on board jumpers
- Address Selection
  - Number of GPIB Adapter (boards) in a PC: 8 max.
  - Address: Fixed, depending on adapter number
  - Adapter number selection: via on board jumpers
- GPIB (IEEE-488) Standards
  - Bus length: 20 meters max.
  - Device separation on bus: 2 meters min.
  - Number of devices on bus: 15 max. (The GPIB board is considered as one device.)
  - Data lines: 8 parallel, 3 handshake
  - Signal level: LO < 0.8V, HI > 2.0V
- General
  - Occupies one slot on IBM PC/XT/AT bus
  - Power consumption: 5VDC, 400mA
  - Operating Temperature: 0 to 50°C
  - Storage Temperature: -20 to 70°C
  - Relative Humidity: 0 to 90%, non-condensing
  - Dimensions: 4.2" x 4.6" x 1.0"
  - External connections via: One IEEE-488 standard 24-pin connector

## Features

- General Purpose Interface Bus (IEEE-488) interface board for IBM PC/XT/AT or compatibles
- Complete Talker/Listener/Controller capability using NEC  $\mu$ PD7210 GPIB TLC chip
- Data transfer rates up to 300 Kbytes/sec with DMA
- Choice of 3 user selectable DMA channels
- Interrupt handling capability with acknowledge
- Choice of 6 user selectable interrupt lines
- Fully compatible with IBM GPIB adapter
- RF-shielded IEEE-488 receptacle
- Half size board fits any expansion slot
- High level application software: Asystant GPIB

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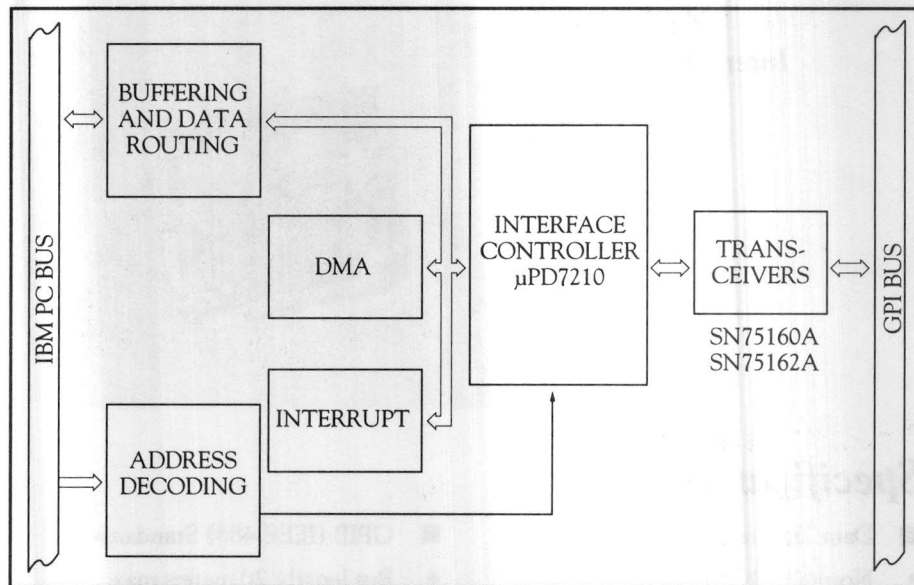
## GPIB

### Functional Description

The CONTEC GPIB board provides a complete interface between the General Purpose Interface Bus, as per IEEE-488 standard, and the IBM PC bus. This interface enables transfer of data between various devices having GPIB capability and IBM PC/XT/AT and compatible machines. Up to 14 such devices can be connected to the GPIB board.

A NEC  $\mu$ PD7210 GPIB TLC chip is used as an interface controller to achieve complete Talker/Listener/Controller capability. Program registers are used to transfer commands and data to and from the GPIB, as well as to control and monitor the interface functions.

Transceivers SN75160A and SN75162A are used between the TLC chip and the GPIB. They provide bus protection when powering up/down.



### Software

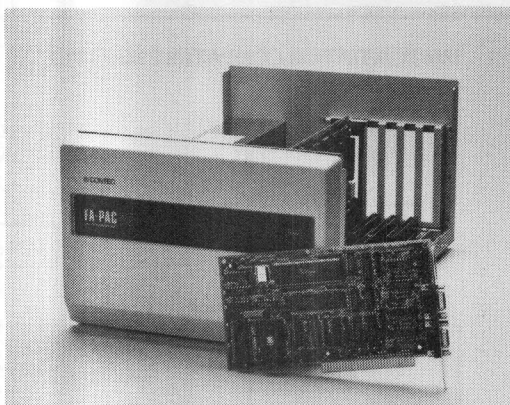
The CONTEC GPIB can be supported by a number of software packages.

- IBM PC GPIB Adapter Programming Support package: (IBM product number 6024201) This package enables the users to write their own application programs in BASICA.
- ASYSTANT GPIB: This package is a menu driven program for the GPIB. Users do not have to write their own application program.
- NI-488 MS-DOS: This package contains an MS-DOS handler, which provides all GPIB talker/listener/controller functions and installs as part of the operating system. It may be called from most popular languages, including BASICA and QuickBASIC.
- LabWindows: it offers an interactive development environment for scientific application software using GPIB. It supports QuickBASIC or C.



# CR-NET

## Remote I/O System



## Specifications

### System Configuration:

- Host unit: One COM-2DS, Communication Controller Board, with two RS-485 lines, plugged into the PC
- Remote unit: FA-PAC chassis with one COM-NET (PC), Remote Controller Board, four slots for CONTEC analog/digital interface boards and power supply unit
- Interconnection between host and remote units: via 2 core twisted pair shielded cable, in party line mode
- Maximum configuration:
  - Host unit: 1
  - Remote units: 30 (15 per RS-485 line)
  - CONTEC analog/digital interface boards: 120
  - Distance of furthest Remote Unit from PC: 3,300 feet on each RS-485 line; Total range: 6,600 feet

### Communication System

- Interface type: RS-485
- Protocol: Half duplex
- Baud rate: 2400, 4800, 9600, 19200 bps

### COM-2DS – Communication Controller Board

- Communication
  - Communication type: RS-485
  - No. of channels: 2
- CPU
  - Type: HD64B180 (6MHz)
- Memory
  - Type and size: EPROM 32KB, SRAM 8KB, dual-ported RAM 2KB
  - Occupied memory area (in PC): 4 (2 port RAM)

## Features

- Offers distributed Data Acquisition and Control for PC-based systems
- 1920 analog channels or 11520 digital channels can be connected to a single PC using up to 120 CONTEC interface boards
- Minimizes cabling cost by using 2 core twisted pair shielded cable, in party line mode between PC and Remote Units, field cabling terminated at the Remote Units
- Provides intelligent communication link, via RS-485, between PC and CONTEC interface boards at different locations
- On-board CPUs drive CONTEC interface boards, generate, check and retry transmission protocols

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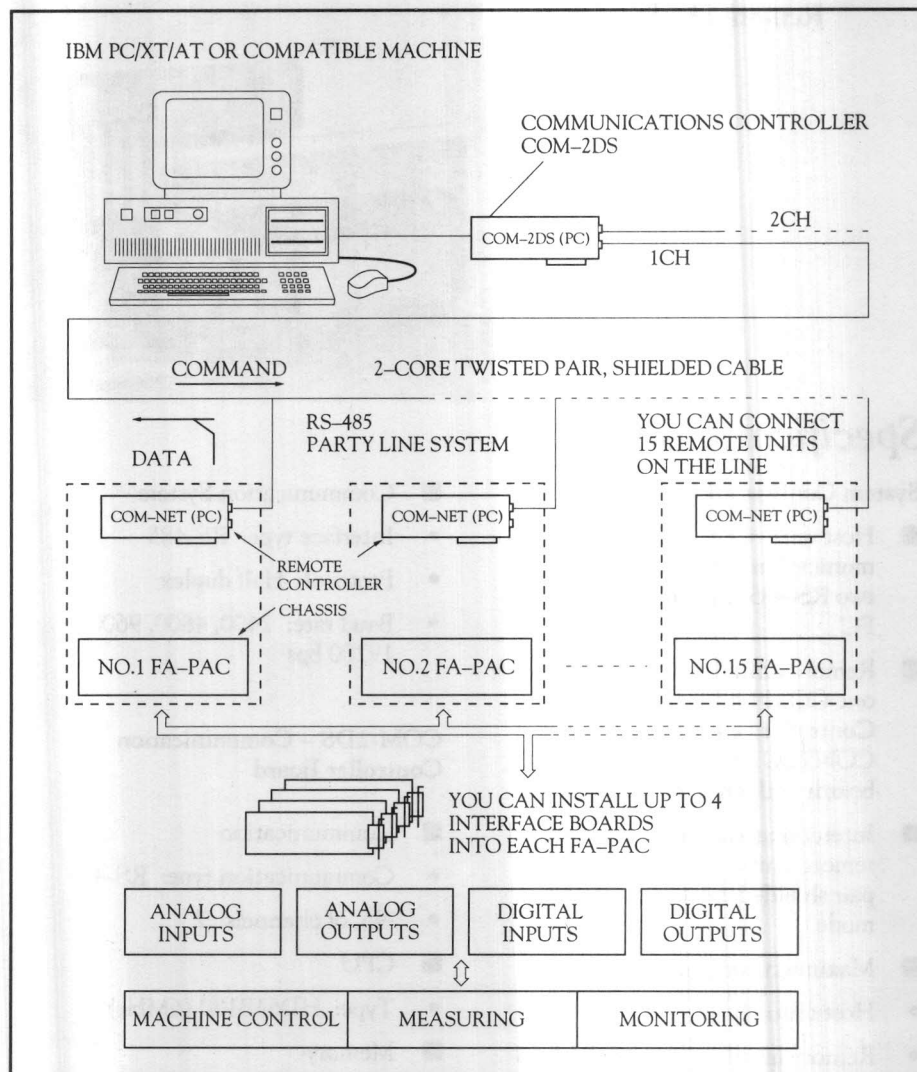
## CR-NET

### Specifications (Continued)

- Interrupt setting (COM-2DS to PC): IRQ 0 to IRQ 6, jumper selectable
- Address selection  
Occupies 4 KBytes of memory. It is recommended that the top memory address is set as a multiple of 4KB. Address setting is via a DIP-switch on board.
- General
  - Occupies one slot on IBM PC/XT/AT bus
  - Power consumption: 5VDC, 600mA
  - Operating temperature: 0 to 50°C
  - Storage temperature: -20 to 50°C
  - Relative humidity: 20 to 90%, non-condensing
  - Size: 4.2" x 7.3" x 1.0"
  - External connection: via 9-pin D-connector

#### COM-NET (PC) – Remote Controller board

- Communication:  
No. of channels: 2,  
1x RS-485, half duplex for remote communication  
1x RS-232C for local communication (only one channel can operate at a time)
- CPU  
Type: HD64B180 (6MHz)
- Memory
  - Type and size: EPROM 32KB, SRAM 8 KB data buffer, EEPROM 8 KB for storing programme parameters



SYSTEM CONFIGURATION

- Address selection  
The FA-PAC number, number of the Remote Unit on a particular RS-485 line has to be set on the corresponding COM-NET(PC) via a DIP-switch on board.
- General
  - Occupies one slot in the Remote Unit, FA-PAC (Chassis)
  - Power consumption: 5VDC, 600mA
  - Operating temperature: 0 to 50°C
  - Storage temperature: -20 to 50°C

## Specifications (Continued)

- Relative humidity: 20 to 90%, non-condensing
- Size: 4.2" x 7.3" x 1.0"
- External connection: via 3-pin miniature connector with removable screw terminals

### FA-PAC – Chassis

- Number of slots:
  - 1 for COM-NET (PC) Remote Controller board
  - 4 for CONTEC interface boards
- Power Supply:
  - Input: 115VAC,  $\pm 10\%$ , 48 to 135HZ
  - Output: +5V, 12A; +12V, 1A; and -12V, 1A
  - AC Power consumption: 100W
- General
  - Operating temperature: 0 to 50°C
  - Storage temperature: -20 to 60°C
  - Relative humidity: 20 to 90%, non-condensing
  - Size: 10.3" x 7.0" x 11.5"
  - Weight: 13 lbs

### CONTEC Interface Boards

ADC-10, ADC-30, ADC-20, ADC-40, ADC-100, ADC-200, ADC-300, PI-32T/L/H, PQ-32T/L/H, PIO-16/16T/L/H, PIO-24/24L, PIO-48W/C/R, PIO-96W

For details of above mentioned boards refer to corresponding Data Sheets

The port addresses have to be set on the individual boards, depending on the type of board and the slot it occupies in the FA-PAC. Port Address setting is via a DIP-switch on each board.

## Functional Description

### CR-NET System

The CONTEC CR-NET, offers distributed Data Acquisition and Control capabilities for PC-based systems. The Remote I/O system, provides an intelligent communication link, via RS-485, between IBM PC/XT/AT or compatible machines and CONTEC analog/digital interface boards at different locations. Up to 120 interface boards can be hooked onto a single PC.

The CR-NET System consists of the following elements:

- A Communication Controller Board, COM-2DS, plugged into an expansion slot in the PC;
- One or more Remote units located in the field; each unit consisting of a FA-PAC chassis, a COM-NET(PC) Remote Controller Board, and up to 4 CONTEC analog/digital interface boards;
- Interconnection between host and remote units via 2 core twisted pair shielded cable, in party line mode.

### COM-2DS-Communication Controller Board

The COM-2DS is an intelligent communication controller boards. It provides two ports for RS-485 communication with the Remote Controller Boards, COM-NET(PC), located in the

Remote Units. Each port can support up to 15 Remote Units. The CPU on board controls the communication with the remote units. It generates error commands and retries transmission, thereby, reducing the overheads on the PC.

Communication between the on-board CPU and the CPU in the PC is via a 2KB dual-ported RAM. In addition, 32KB EPROM and 8KB SRAM are provided for the firmware.

The board is capable of generating an interrupt signal which can be allocated via jumpers to IRQ 0 through IRQ 6.

DIP-switches are provided on board for:

- memory address selection
- baud rate selection – 2400/4800/9600/19,200

External connection to the remote units is via a two core twisted pair shielded cable per port, using miniature terminal connectors.

### COM-NET(PC) – Remote Controller Board

The COM-NET(PC) plugs into the Remote Unit, FA-PAC. It is an intelligent controller board. It provides one port for RS-485 communication with the COM-2DS located in the PC. The CPU on board controls data processing by the interface boards and transmission to the host. The board is provided with 32KB EPROM, 8KB SRAM and 8KB for storing data set-up data for the required configuration.

An addition, RS-232C port is provided for local communication.



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WARRANTY

## CR-NET

DIP-switches are provided on board for:

- Address selection – Remote unit number
- Baud rate selection – 2400/4800/9600/19,200
- Terminator indication (last in line)

External connections:

- to the PC, using the RS-485 line, are via a two core twisted pair shielded cable, in party line mode, using a 3-pin miniature connector with removable screw terminals
- For the RS-232C line are via a 26-pin header connector.

### FA-PAC Chassis

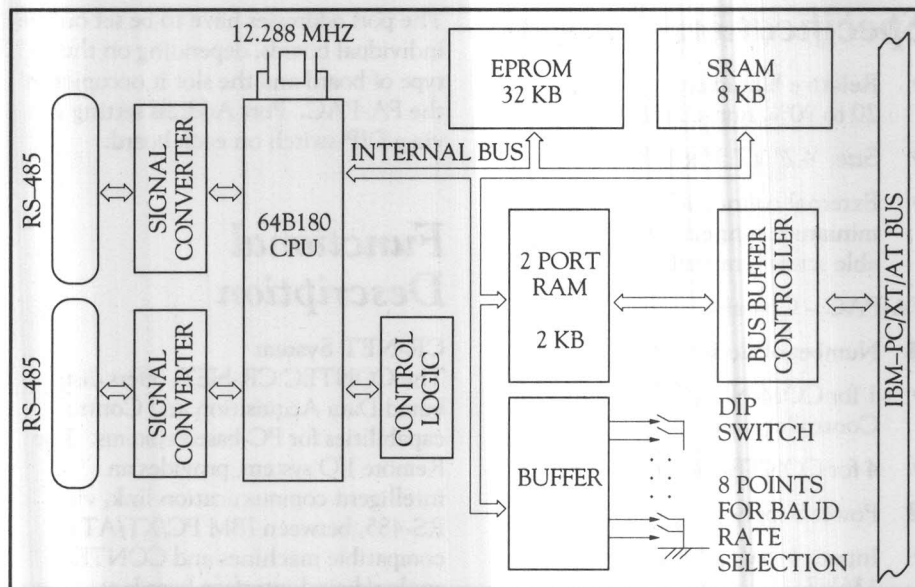
The FA-PAC chassis contains a back plane with an IBM PC/XT bus structure, one slot for the COM-NET(PC) and four expansion slots for CONTEC interface boards.

Field signals are connected to the interface boards via corresponding connectors.

The FA-PAC can be connected directly to 115AC mains. It contains a power supply unit for 115VAC/ +5V, +12V, -12V

### CONTEC Interface Boards

When used in the CR-NET system, the CONTEC Interface Boards retain their individual function capabilities. The only exception being their interrupt capabilities. Interrupts are only generated by the COM-2DS, Communication Controller Board.



COM 2DS – BLOCK DIAGRAM

## Address Selection

**COM-2DS:** The COM-2DS occupies 4KBytes of memory. It is recommended that the top memory address is set as a multiple of 4KB. Address setting is via a DIP-switch on board.

**COM-NET(PC):** The FA-PAC number, number of the Remote Unit on a particular RS-485 line has to be set on the corresponding COM-NET(PC) via a DIP-switch on board.

**CONTEC Interface Boards:** The port addresses have to be set on the individual boards, depending on the type of board and the slot it occupies in the FA-PAC. Port Address setting is via a DIP-switch on each board.

## Software & Programming

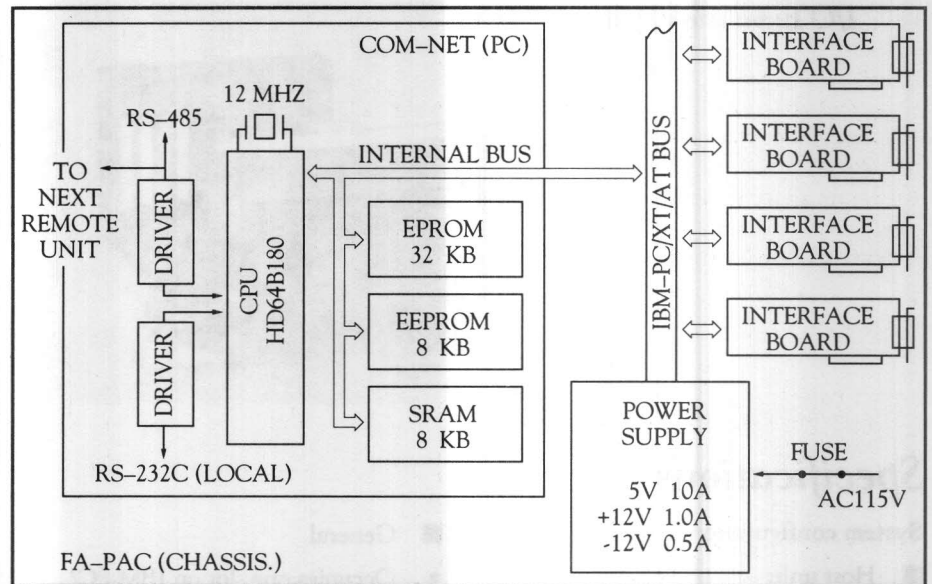
Firmware is provided on the COM-2DS and the COM-NET(PC). The firmware provided on the COM-2DS takes care of communication protocols and controls. The firmware on the COM-NET(PC) contains the drivers required for the various CONTEC Analog and Digital Interface Boards.

Support software for the CR-NET is provided through a series of program files on a floppy disk supplied with the system. These consist of a driver program and a series of sample programs for A/D conversion, D/A conversion, Digital Inputs, digital Outputs, System Commands, RS-485 communication and RS-232C communication. Though the driver program is in machine language, the sample programs are in BASIC, making it easy for the user to configure an application program.

## Ordering Information

When ordering a CR-NET system, the following items need to be ordered individually depending on the configuration:

- COM-2DS, quantity: 1 unit/system
- FA-PAC, quantity: depends on the configuration
- COM-NET(PC), quantity: one unit/FA-PAC unit
- Various interface boards along with corresponding terminal panels and interconnection cables, quantity: depends on the configuration.

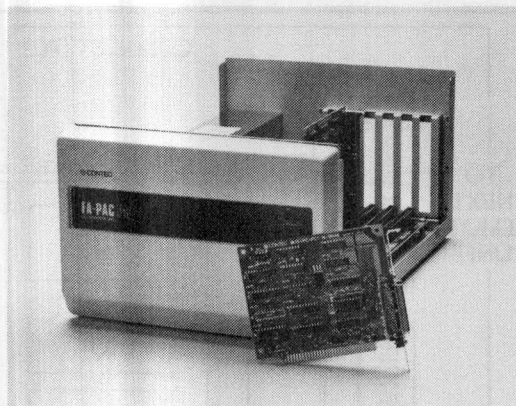


COM-NET (PC) - BLOCK DIAGRAM

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# CR-PAC

## I/O Expansion System



## Features

- I/O Expansion System for IBM PC/XT/AT or compatible computers
- Offers 5 expansion slots on PC Bus for general purpose use
- Contains own power supply
- Facilitates wide variety of configurations and applications for laboratory, factory or office automation

## Specifications

### System configuration

- Host unit:  
One Bus-PC(PC), Bus Expansion board plugged into the PC
- Expansion Unit:  
FA-PAC chassis with one BUS-PAC(PC) Bus Expansion Receiver board, five expansion slots for PC XT interface boards and power supply unit
- Cable for interconnection between the PC and the Expansion unit

### ■ General

- Occupies one slot on IBM PC/XT/AT bus
- Power consumption: 5VDC, 380mA
- Operating temperature: 0 to 50°C
- Storage temperature: -20 to 60°C
- Relative humidity: 20 to 90%, non-condensing
- Size: 4.2" x 7.3" x 1.0"
- External connection: via 62-pin high density D-connector

### BUS-PC(PC), Bus Expansion board

- Communication
  - Signal level: TTL
  - Data Bus: 8-bit XT bus
  - Fan out: 20mA
- System Memory Occupied
  - Size: Minimum - 64K, Maximum 640K (Depends on type of interface boards used)
  - Selection:  
via a DIP-switch on board.

### BUS-PAC(PC) Bus Expansion Receiver board

- Communication
  - Signal level: TTL
  - Data Bus: 8-bit XT bus
  - Fan out: 20mA
- General
  - Occupies one slot in the Expansion Unit, FA-PAC (Chassis)
  - Power consumption: 5VDC, 300mA

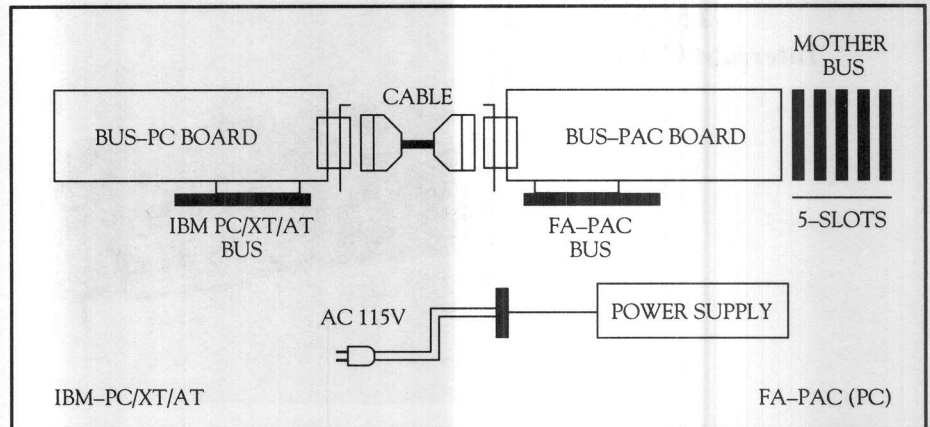


## Specifications (Continued)

- Operating temperature: 0 to 50°C
- Storage temperature: -20 to 60°C
- Relative humidity: 20 to 90%, non-condensing
- Size: 4.2" x 7.3" x 1.0"
- External connection: via 62-pin high density D-connector

### FA-PAC – Chassis

- Number of slots:  
1 for BUS-PAC(PC) Bus Expansion Receiver board  
5 for PC/XT interface boards
- Power Supply:
  - Input: 85VAC to 135VAC, 47 to 440HZ
  - Output: + 5V, 12A; + 12V, 1A; and - 12V, 1A
  - AC Power consumption: 100 W
- General
  - Operating temperature: 0 to 50°C
  - Storage temperature: -20 to 60°C
  - Relative humidity: 20 to 90%, non-condensing
  - Size: 10.3" x 7.0" x 11.5"
  - Weight: 13 lbs
- Interconnection Cable
  - Type: 62 core shielded cable
  - Length: 3 feet
  - Connectors: One 62-pin high density D-connector at each end



## Functional Description

The CR-PAC is an I/O expansion system that augments the number of expansion slots available for working with IBM PC/XT/AT or compatible machines.

The expansion system consists of a chassis containing a mother board with six PC/XT expansion slots and its own power supply unit; two I/O expansion boards – one as the PC interface and the other as a receiver board; and a meter long cable to interconnect the two I/O expansion boards.

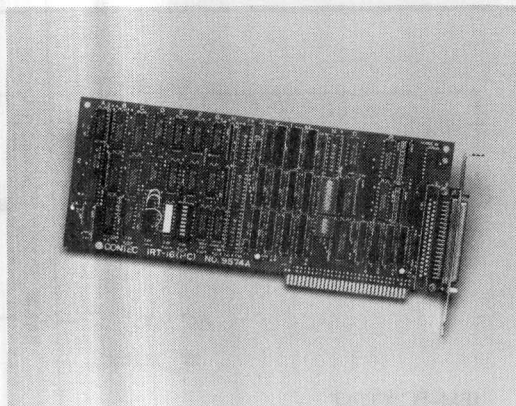
The Bus Expansion board, BUS-PC(PC), located in a PC slot provides the interface circuit between the computer and the FA-PAC Expansion unit. The BUS-PAC(PC) is the Bus Expansion Receiver board. It is located and occupies one slot in the FA-PAC. The remaining five expansion slots in the FA-PAC are free to be used with any type of interface board which can operate on PC/XT machines.

Communication between the PC and the Expansion unit is via TTL-level signals.

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# IRT-16

## 16-Channel Interrupt Controller



## Specifications

### ■ Inputs

- Number of input channels: 16 (gated to give 2 IRQ levels)
- Number of input ports: 2, each of 8 bits
- Input level: TTL-5VDC or 12-24VDC with opto-isolation
- Input logic: Positive or negative logic
- Input impedance: TTL-level – 1 LS-TTL  
Opto-isolated – 2 kohms
- Interrupt pulse width: 50  $\mu$ sec minimum

### ■ Internal clock

- Selectable: 1  $\mu$ sec. to 2 min

### ■ Interrupts

- Number of interrupts: 3, (2 ext. and 1 from clock)
- Interrupt levels: Any three levels IRQ2 – IRQ7

### ■ Address Selection

- Any 2 byte boundary

### ■ General

- Occupies one slot on IBM PC/XT/AT bus
- Power consumption: 5VDC, 800mA
- Operating Temperature: 0 to 50°C
- Storage Temperature: -20 to 70°C
- Relative Humidity: 0 to 90%, non-condensing
- Dimensions: 4.2" x 9.7" x 1.0"
- External connections via: One 37-pin D-connector

## Features

- Plug-in board for IBM PC/XT/AT bus
- 16 channels for external interrupt signals
- Signals can be TTL-level or 12-24VDC opto-isolated
- Accepts positive or negative logic levels
- Includes template for interrupt handling development
- Pacer clock generates periodic interrupt signals
- Software drivers provided for application program development

## Functional Description

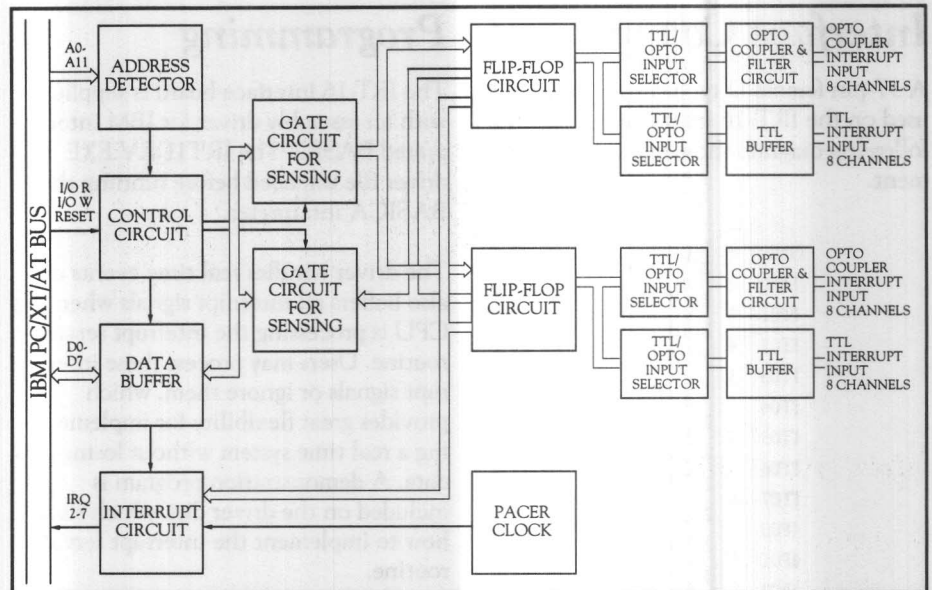
The IRT-16 interface board is a real-time adapter card configured for the IBM PC bus. The IRT-16 can be used in complex event-driven systems, and can serve to unburden a host computer.

The IRT-16 interface board supports 16 interrupt input points. Interrupt signals to the CPU are gathered into two groups of eight points each and gated into two interrupt request (IRQ) levels. The interrupt signals can be switched between opto-coupler-isolated and TTL input, with positive or negative logic selected by a jumper.

Two 8-bit registers have been designed to store the concurrent external interrupt signals. When more than two interrupt signals are detected at the same time through the same IRQ level, the interrupt handler reads the corresponding buffer register and determines which interrupt is serviced first. This greatly simplifies prioritization of interrupt lines for real-time applications. In addition, the IRT-16 has a pacer clock to provide a periodic interrupt signal service.

## Base Address

The IRT-16 board requires two consecutive addresses for internal use. The base address can be set with DIP switches.



## Pacer Clock

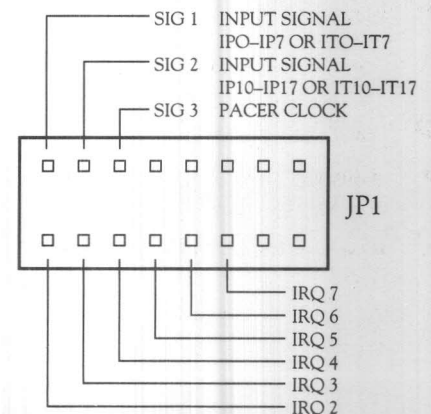
An on-board oscillator is provided to automatically generate cyclical interrupts on the PC bus. Using SW3, users may set the oscillator clock cycle between one microsecond to two minutes.

## Selection of Input and Logic

Selection of input signal levels – TTL or 12-24VDC, and logic levels – positive or negative is done via jumpers on board.

## Interrupt Jumper

There are three interrupt signals generated by the IRT-16 interface board. SIG1 and SIG2 are connected to interrupt channel 0 to 7 and channel 10 to 17 respectively. The signal SIG3 is generated by the pacer clock. In order to use interrupt signals with this interface board, the user needs to connect jumpers on JP1. The interrupt signals will be sent to the CPU through JP1 as shown in the diagram below.





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## IRT-16

### Interface Connectors

A 37-pin female D-type connector is used on the IRT-16 interface board. The following diagram shows its pin assignment.

|      |    |    |      |
|------|----|----|------|
| GND  | 1  | 20 | GND  |
| IT00 | 2  | 21 | IT10 |
| IT01 | 3  | 22 | IT11 |
| IT02 | 4  | 23 | IT12 |
| IT03 | 5  | 24 | IT13 |
| IT04 | 6  | 25 | IT14 |
| IT05 | 7  | 26 | IT15 |
| IT06 | 8  | 27 | IT16 |
| IT07 | 9  | 28 | IT17 |
| IP00 | 10 | 29 | IP10 |
| IP01 | 11 | 30 | IP11 |
| IP02 | 12 | 31 | IP12 |
| IP03 | 13 | 32 | IP13 |
| IP04 | 14 | 33 | IP14 |
| IP05 | 15 | 34 | IP15 |
| IP06 | 16 | 35 | IP16 |
| IP07 | 17 | 36 | IP17 |
| P0   | 18 | 37 | P1   |
|      | 19 |    |      |

REAR VIEW

IT = TTL-level input  
IP = 12-24 VDC input

### Programming

The IRT-16 interface board is supplied with an assembly driver for IBM interpreted BASIC. The IRT1DRV.EXE driver file is loaded before running the BASICA interpreter.

The driver handles real time events and also buffers all interrupt signals when the CPU is processing the interrupt service routine. Users may process these interrupt signals or ignore them, which provides great flexibility for implementing a real time system without losing any data. A demonstration program is included on the driver disk which shows how to implement the interrupt service routine.

### Accessories

- A. Included with the board
  1. D-Connector (loose)
  2. Users Manual
  3. Floppy disk containing software drivers and sample programs
- B. Optional – to be ordered extra

#### 1180010 Panel DTP-1

Digital terminal panel for IRT-16 board with 36 flat mount type terminals.

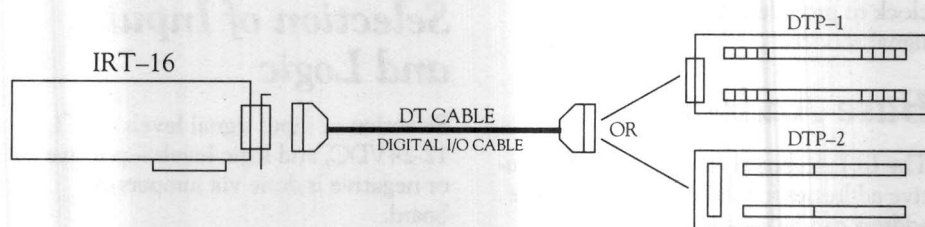
#### 1180020 Panel DTP-2

Digital terminal panel with 36 miniature type terminals.

#### 1180030 DT-Cable

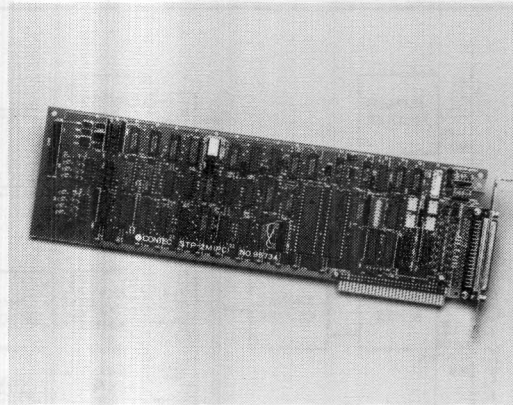
Four foot long, 40-wire shielded digital terminal cable with two 37-pin male D-type connectors.

### Product Configuration



# STP-2M

## Stepper Motor Controller



## Specifications

### ■ Controller

- Number of Axes: 2
- Output Pulse Frequency: 1 to 245,730 pulses per second (pps)
- Output Pulse Duty Ratio: 50%
- Output Pulse Signals: CW, CCW or common pulse and direction signals
- Limit Switches: 5 total: origin, forward and reverse end limits, forward and reverse high speed end limits
- Limit Input Type: opto-isolated input
- Synchronous Control: available with master/slave change over
- Interrupt Signals: output
- Controller Chip: PCL-240 or equivalent

### ■ Feedback Counter

- Counter Size: Two 16-bit counters or one 32-bit counter

- Input Pulse Frequency: 500 KHz maximum
- Input Pulse Type: phase or up/down counter pulse
- Input Pulse Signals: TTL-level or opto-isolated (12–24VDC)

### General Purpose Input/Output port

#### ■ Inputs

- Number of input channels: 8
- Input level: 12–24VDC with opto-isolation
- Input impedance: 2 kohms (12A at 24VDC)
- Number of input interrupts: 1

#### ■ Outputs

- Number of output channels: 8
- Output type: Open collector
- Output level: 12–24VDC with opto-isolation
- Output load: 35VDC, 20mA max.

#### ■ Interrupts

- Number of interrupts: 2, (int. 1, ext. input 1)

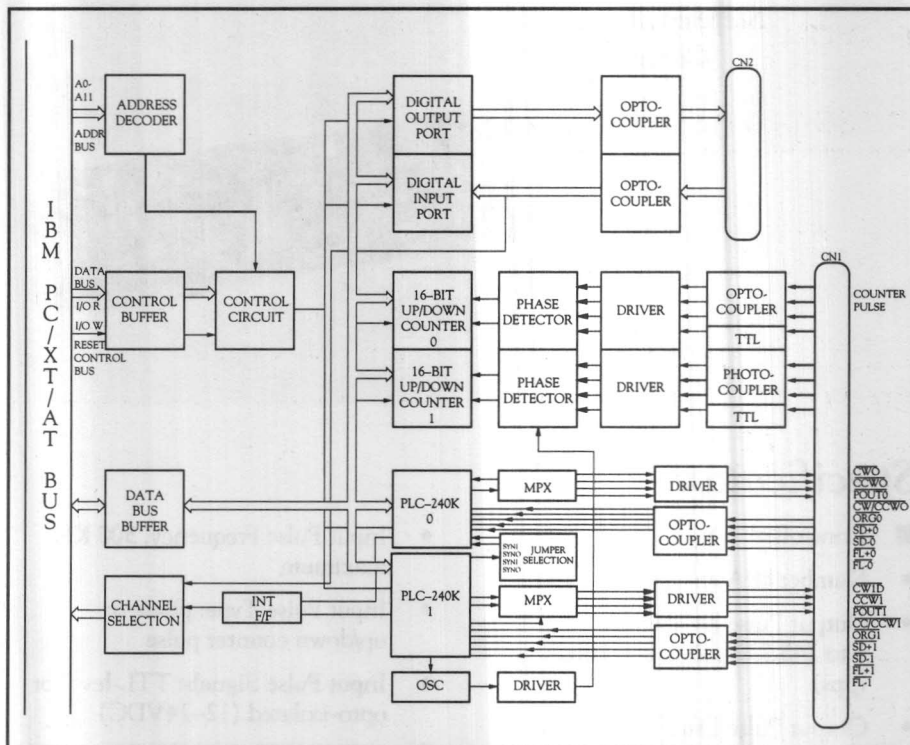
## Features

- Plug-in board for IBM PC/XT/AT Bus
- Simultaneous or independent control of two motors
- Interfaces with any type of incremental encoder
- Photocoupler isolated or TTL input and output ports
- Provides a large number of commands
- Generates high speed pulses
- Limit switch compatible
- Interrupt signal generation
- Register-programmed speed control
- Feedback counter can be operated with phase pulse or up/down counter

# STP-2M

### Specifications (Continued)

- Interrupt level: any two levels IRQ2 – IRQ7
- Address Selection
  - Any 32 byte boundary
- General
  - Occupies one slot on IBM PC/XT/AT bus
  - Power consumption: 5VDC, 850mA
  - Operating Temperature: 0 to 50°C
  - Storage Temperature: –20 to 70°C
  - Relative Humidity: 0 to 90%, non-condensing
  - Dimensions: 4.2" x 13.1" x 1.0"
  - External connections via: One 37-pin D-connector and one 30-pin flat cable connector



## Functional Description

The STP-2M interface board is a stepping motor controller for IBM PC/XT/AT and compatibles used in integrated industrial or laboratory motion control environments.

The STP-2M board can control two stepping motors simultaneously, at up to 245,730 pulses per second (pps) each. The STP-2M occupies 32 bytes of the IBM PC I/O port. Eight bytes are used directly for the two 16-bit counters included with this board. Each counter can be connected directly to any type of incremental encoder.

The input to this board is a string of user-programmed high-level commands.

The controller interprets these commands using a prestored conversion table, generating the necessary pulse stream to control motor direction, velocity, and acceleration.

The instruction speed can be specified in increments of 10 pps. Multi-axis control with synchronous operation is available. Two axes per board allow movement of two motors around a curve. Two 16-bit feedback counters are provided for encoder feedback control. A phase discrimination circuit allows fine resolution encoder input. Two types of input are available: TTL and opto-coupled.

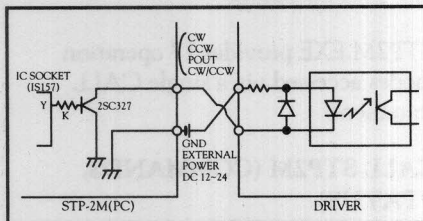
## Setting Up I/O Base Address

The base addresses for the STP-2M board can be set up with DIP-switch SW1. This board requires 32 consecutive addresses for its internal use, so that the DIP-switch positions A5 to A11 are valid for the base address.

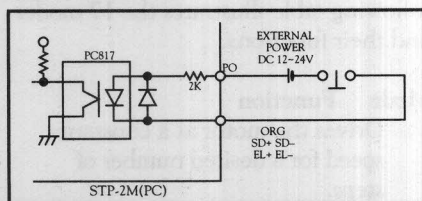


## Internal Circuitry

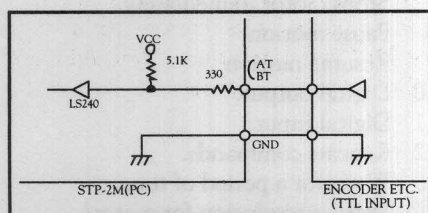
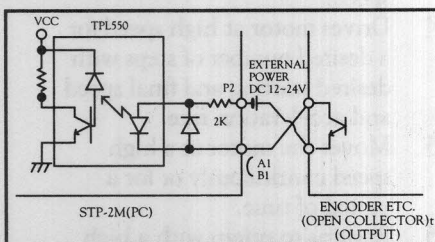
### PULSE OUTPUT CIRCUIT



### LIMIT SWITCHES INPUT CIRCUITRY

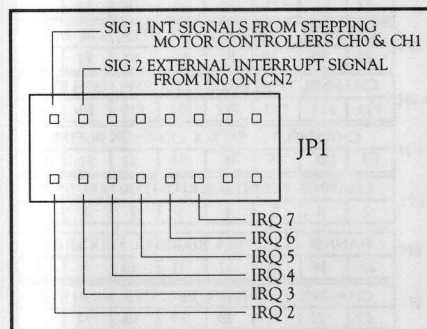


### FEEDBACK COUNTER INPUT CIRCUIT



## Interrupt Signals

Two interrupt signals are generated by the STP-2M interface board. In order to use interrupt signals with this interface board, the user must connect the interrupt signals from the stepping motor controllers Channel 0 and Channel 1 and the external interrupt request (IRQ) level. The following diagram shows the interrupt jumper pin locations:



## Jumper Settings

The encoder pulse to the feedback counter generates an up/down count pulse through the phase detection circuit. In addition, JP6 and JP8 can be used to specify multiplication of the up/down output pulse frequency by 1, 2, or 4.

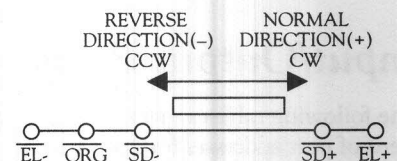
| JP6, 8        | DESCRIPTION                                     |
|---------------|-------------------------------------------------|
| NO. 1 SHORTED | MULTIPLICATION OF THE UP/DOWN OUTPUT PULSE BY 1 |
| NO. 2 SHORTED | MULTIPLICATION OF THE UP/DOWN OUTPUT PULSE BY 2 |
| NO. 3 SHORTED | MULTIPLICATION OF THE UP/DOWN OUTPUT PULSE BY 4 |

Two stepper motor controllers are provided on the STP-2M board, allowing synchronous operation of two motors. JP7 is used to specify which controller is the master and which is the slave.

| JP7           | DESCRIPTION                                           |
|---------------|-------------------------------------------------------|
| PIN 1 SHORTED | PLC-80K(0) BECOMES MASTER<br>PLC-80K(1) BECOMES SLAVE |
| PIN 2 SHORTED | PLC-80K(1) BECOMES MASTER<br>PLC-80K(0) BECOMES SLAVE |
| PIN 3 SHORTED | EACH MOTOR OPERATES INDEPENDENTLY                     |

The output logic of the pulse output circuit can be changed via JP9 and JP10. JP9 controls Channel 1, JP10 controls Channel 2.

| JP9/JP10           | PULSE OUTPUT   |
|--------------------|----------------|
| SHORT PINS 1 AND 2 | NEGATIVE LOGIC |
| SHORT PINS 2 AND 3 | POSITIVE LOGIC |



## The Limit Switches

Normally-closed (NC) limit switches should be used with this board. When the switches open, a signal is generated at the corresponding input to the STP-2M board. When the limit switches are not in use, the corresponding pins to all limit switches must be connected to the external power source.

### The ORG Switch

The ORG switch causes a limit at the point of origin. If this switch opens during a point of origin return, the motor suddenly stops. The ORG switch can be treated as a status switch.

### The EL+/EL- Switch

This switch causes normal direction and reverse direction limits. If the pulse

## Limit Switches (Continued)

output is a direction signal, and the limit switch for that direction opens, the motor suddenly stops. After the stop, a pulse cannot be output to that direction. However, a pulse output to the opposite direction is possible. This switch can be treated as a status switch.

### The SD+/SD- Switch

This switch causes normal direction and reverse direction high-speed limits. During a high-speed start, if there is a direction signal, and the limit switch for that direction opens, the motor slows down. After this, if the limit switch closes, the motor speeds up.

## Input/Output Ports

The following tables show the assignment of port addresses for the various registers of the converter board. Note that the actual location of each register is at the selected base address plus a specified offset. An "/" mark indicates a "don't care" bit.

## OUTPUT PORTS

|       | D7                                      | D6   | D5   | D4   | D3   | D2   | D1   | D0   |
|-------|-----------------------------------------|------|------|------|------|------|------|------|
| + OH  | CHANNEL 0 FEEDBACK COUNTER: LOW BYTE    |      |      |      |      |      |      |      |
|       | F7                                      | F6   | F5   | F4   | F3   | F2   | F1   | F0   |
| + 1H  | CHANNEL 0 FEEDBACK COUNTER: HIGH BYTE   |      |      |      |      |      |      |      |
|       | F15                                     | F14  | F13  | F12  | F11  | F10  | F9   | F8   |
| + 3H  | FEEDBACK COUNTER INPUT SELECTION        |      |      |      |      |      |      |      |
|       | U/D                                     | T/P  |      |      |      |      |      |      |
| + 4H  | CHANNEL 0 CONTROL COMMON BUFFER         |      |      |      |      |      |      |      |
|       | C1                                      | C0   | S5   | S4   | S3   | S2   | S1   | S0   |
| + 5H  | CHANNEL 0 CONTROL REGISTER: LOW BYTE    |      |      |      |      |      |      |      |
|       | 7                                       | 6    | 5    | 4    | 3    | 2    | 1    | 0    |
| + 6H  | CHANNEL 0 CONTROL REGISTER: MIDDLE BYTE |      |      |      |      |      |      |      |
|       | 15                                      | 14   | 13   | 12   | 11   | 10   | 9    | 8    |
| + 7H  | CHANNEL 0 CONTROL REGISTER: HIGH BYTE   |      |      |      |      |      |      |      |
|       | 23                                      | 22   | 21   | 20   | 19   | 18   | 17   | 16   |
| + 8H  | CHANNEL 1 FEEDBACK COUNTER: LOW BYTE    |      |      |      |      |      |      |      |
|       | F7                                      | F6   | F5   | F4   | F3   | F2   | F1   | F0   |
| + 9H  | CHANNEL 1 FEEDBACK COUNTER: HIGH BYTE   |      |      |      |      |      |      |      |
|       | F15                                     | F14  | F13  | F12  | F11  | F10  | F9   | F8   |
| + CH  | CHANNEL 1 CONTROL COMMON BUFFER         |      |      |      |      |      |      |      |
|       | C1                                      | C0   | S5   | S4   | S3   | S2   | S1   | S0   |
| + DH  | CHANNEL 1 CONTROL REGISTER: LOW BYTE    |      |      |      |      |      |      |      |
|       | 7                                       | 6    | 5    | 4    | 3    | 2    | 1    | 0    |
| + EH  | CHANNEL 1 CONTROL REGISTER: MIDDLE BYTE |      |      |      |      |      |      |      |
|       | 15                                      | 14   | 13   | 12   | 11   | 10   | 9    | 8    |
| + FH  | CHANNEL 1 CONTROL REGISTER: HIGH BYTE   |      |      |      |      |      |      |      |
|       | 23                                      | 22   | 21   | 20   | 19   | 18   | 17   | 16   |
| + 10H | GENERAL PURPOSE OUTPUT PORTS            |      |      |      |      |      |      |      |
|       | OUT7                                    | OUT6 | OUT5 | OUT4 | OUT3 | OUT2 | OUT1 | OUT0 |

## Command Registers

The STP-2M exercises control over the stepping motors it drives by means of digital control words stored in registers. These registers are examined during the operation of a motor control program, and the motors are driven accordingly. There are eight registers associated with the STP-2M.

## Programming

Included with each STP-2M board is a driver program (STP2M.EXE) which provides a set of high level function calls for interpretive BASIC programming. STP2M.EXE is a DOS resident machine language I/O driver to control basic stepper, encoder and digital I/O functions. A demonstration program

(DEMO.BAS) is provided to illustrate the use of these functions. It is also possible to program the STP-2M using any high level language with normal I/O port commands.

STP2M.EXE provides 17 operation modes accessed via a single CALL statement:

### CALL STP2M (COMMAND\$, STATUS)

The COMMAND\$ contains the mode number and the necessary data to perform a particular function. The following table illustrates the 17 modes and their functions.

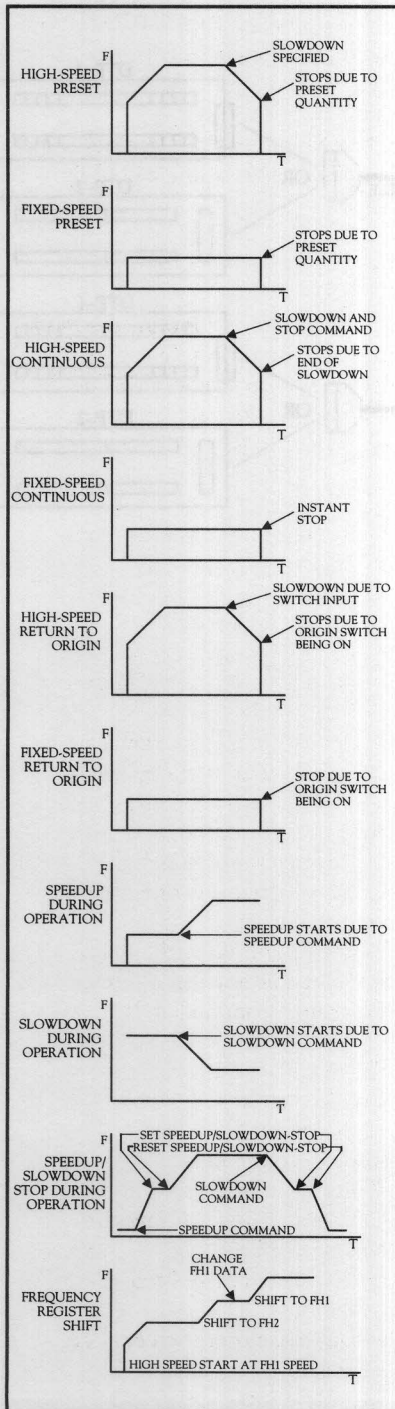
#### Mode Function

- 1 Drives the motor at a constant speed for a desired number of steps.
- 2 Drives the motor at a constant speed for a period of time.
- 3 Returns to origin at a constant speed.
- 4 Drives motor at high speed for a desired number of steps with desired starting and final speed and acceleration rate.
- 5 Moves the motor at a high speed continuously or for a period of time.
- 6 Returns to origin with a high speed and acceleration rate.
- 7 Stops motor immediately.
- 8 Pause motion.
- 9 Resume motion.
- 10 Digital output.
- 11 Digital input.
- 12 Repeats commands.
- 13 Waits for a period of time.
- 14 Defines resolution for motor/encoder.
- 15 Locks motor at a desired position.
- 16 Moves the motor with encoder feedback.
- 17 Reports status



# STP-2M

## OPERATING PATTERNS



## Connectors

A 37-pin connector (CN1) and a 30-pin connector (CN2) provide the connection between the board and the appropriate peripherals. CN1 is used for the stepper motor controller, and CN2 is used for the general purpose I/O ports.

## CN2 CONNECTOR

| DESCRIPTION                | SIGNAL | PIN NO | SIGNAL | DESCRIPTION                 |
|----------------------------|--------|--------|--------|-----------------------------|
|                            | A      | 1      | B      |                             |
|                            | P      | 2      | P      |                             |
| PLUS COMMON (INPUT PORTS)  | P      | 3      | P      | PLUS COMMON (OUTPUT PORTS)  |
|                            | IN0    | 4      | OUT0   |                             |
|                            | IN1    | 5      | OUT1   |                             |
|                            | IN2    | 6      | OUT2   |                             |
|                            | IN3    | 7      | OUT3   |                             |
|                            | IN4    | 8      | OUT4   |                             |
|                            | IN5    | 9      | OUT5   |                             |
|                            | IN6    | 10     | OUT6   |                             |
|                            | IN7    | 11     | OUT7   |                             |
|                            | N      | 12     | N      |                             |
|                            | N      | 13     | N      |                             |
|                            | N      | 14     | N      |                             |
| MINUS COMMON (INPUT PORTS) | N      | 15     | N      | MINUS COMMON (OUTPUT PORTS) |

## CN1 CONNECTOR

| DESCRIPTION                     | SIGNAL NAME |    | SIGNAL NAME | DESCRIPTION                     |
|---------------------------------|-------------|----|-------------|---------------------------------|
| NOT CONNECTED                   | NC          | 19 | P0 (+)      | CH0 PLUS COMMON                 |
| CH1 1 PLUS COMMON               | PI          | 18 | ORG0        | CH0 ORIGIN LIMIT INPUT          |
| CH1 1 ORIGIN LIMIT INPUT        | ORG1        | 17 | SD+0        | CH0 NORMAL DIR HIGH LIMIT INPUT |
| CH1 NORMAL DIR HIGH LIMIT INPUT | SD+1        | 16 | SD-0        | CH0 REV DIR HIGH LIMIT INPUT    |
| CH1 REV DIR HIGH LIMIT INPUT    | SD+1        | 15 | EL+0        | CH0 NORMAL DIR HIGH LIMIT INPUT |
| CH1 NORMAL DIR HIGH LIMIT INPUT | EL+1        | 14 | EL-0        | CH0 REV DIR HIGH LIMIT INPUT    |
| CH1 REV DIR HIGH LIMIT INPUT    | EL-1        | 13 | BIT         | FEEDBACK COUNTER IN (PC)        |
| FEEDBACK COUNTER IN (PC)        | B2T         | 12 | AIT         | FEEDBACK COUNTER IN (PC)        |
| FEEDBACK COUNTER IN (PC)        | A2T         | 11 | N0(-)       | MINUS COMMON (UNUSED)           |
| MINUS COMMON (USED)             | N-1(+)      | 10 | NC          | NOT CONNECTED                   |
| NOT CONNECTED                   | NC          | 9  | P5V         | INTERNAL 5V OUT                 |
| INTERNAL 5V OUTPUT              | P5V         | 8  | CW0         | CH0 NORMAL DIRECTION PULSE OUT  |
| CH1 NORMAL DIRECTION PULSE OUT  | CW1         | 7  | CCW0        | CH0 REVERSE DIR PULSE OUT       |
| CH1 REVERSE DIR PULSE OUT       | CCW1        | 6  | POUT        | CH0 COMMON PULSE OUT            |
| CH1 COMMON PULSE OUT            | POUT1       | 5  | CW/CCW0     | CH0 DIRECTION SIGNAL OUT        |
| CH1 DIRECTION SIGNAL OUT        | CW/CCW1     | 4  | BT0         | FEEDBACK COUNTER (TTL)          |
| FEEDBACK COUNTER (TTL)          | BT1         | 3  | AT0         | FEEDBACK COUNTER (TTL)          |
| FEEDBACK COUNTER (TTL)          | AT1         | 2  | GND         | INTERNAL GROUND                 |
| INTERNAL GROUND                 | GND         | 1  |             |                                 |



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## Accessories

### A. Included with the board

1. Users Manual
2. Floppy disk containing software drivers and sample programs

### B. Optional – to be ordered extra

#### 1180010 PANEL DTP-1

Digital terminal panel with 36 flat mount type terminals.

#### 1180020 PANEL DTP-2

Digital terminal panel with 36 mini-ature-type terminals.

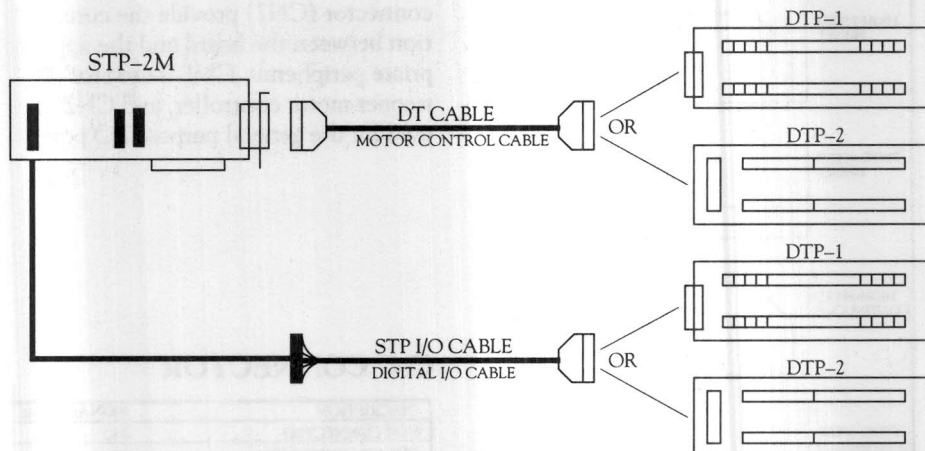
#### 1180030 DT-CABLE

Four foot long, 40-wire shielded digital terminal cable with two 37-pin male D-type connectors.

#### 1580010 STPI/O Cable

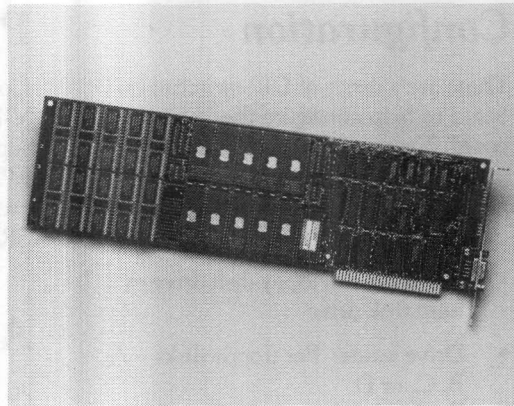
Three foot long, shielded cable with 30-pin flat ribbon connector and 37-pin male D-type connector.

## Product Configuration



# V-DISK

## Virtual Memory Boards



## Specifications

- Configurations and capacities
  - As Hard disk: 2.4 Mbyte; Max. 20 Mbyte using 8 boards
  - As Floppy disk: 2 x 1.2 Mbyte; Max. 2 boards, can be configured as A, B, C, D drives
- Memory devices: 1 Mbit/chip
  - EPROM: HN27C101G or HN27C301G
  - SRAM: HM 66204L
- EPROM write function
  - With W-EPROM software and power supply unit (optional)
- Memory protection for SRAM
  - With back-up battery unit BU-RAM (optional) data can be maintained for two months
- General
  - Occupies one slot on IBM PC/XT/AT bus
  - Power consumption: 5VDC, 500mA
  - Operating Temperature: 0 to 60°C
  - Storage Temperature: -20 to 70°C
  - Relative Humidity: 0 to 90%, non-condensing
  - Dimensions: 4.2" x 13.1" x 1.0"
  - External connections via: One 9-pin D-connector; for back-up battery BU-RAM and/or power supply W-EPROM

## Features

- Plug-in board for IBM PC/XT/AT bus
- Virtual disk memory board with 2.4 Mbyte capacity
- Ideal for harsh environments where disks fail
- Available with EPROM or SRAM or combination
- Emulates any floppy or hard disk format
- Offers 20 Mbyte hard disk capacity with multiple boards
- 50 times faster than floppy disks; 10 times faster than hard disks
- EPROM write function available
- Memory protection for SRAM available

## V-DISK

### Functional Description

The Contec V-Disk board acts as a virtual disk on any IBM-PC/XT/AT or compatible computer. Containing up to 2.4 Mbyte of SRAM or EPROM, the board can emulate any format or density of floppy or hard disk.

A single V-Disk board can emulate two floppy disks, in 320 Kb, 360 Kb, 720 Kb or 1.2 Mb formats. When used as a hard disk up to 8 V-Disk boards may be used in one system, for a total capacity of up to 20 Mbytes.

If the V-Disk board is used with SRAM devices, it can operate as a RAM disk at up to 10 times the speed of a fast hard disk. This allows the user to use DMA data capture and other applications at a far higher speed than is otherwise possible. In addition, this configuration is ideal for use under harsh operating conditions which would cause failure of mechanical disk systems, including high or low temperatures, high vibration, and high dust content environments. The SRAM can be backed up by connecting the optional BU-RAM (PC) battery.

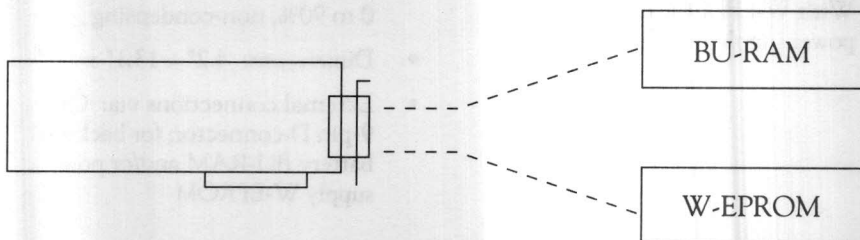
If the V-Disk board is used with EPROM devices, it operates as a Read Only disk. This prevents accidental data loss through disk failure or incorrect operation. In addition, the V-Disk can be used to program EPROM devices at very high speeds when used with an optional power supply.

### Configuration

There are a series of DIP-switches on board to help configure the V-Disk board. These enable set the following parameters:

- Type of chips: EPROM or SRAM per 1.2 Mbyte block
- Drive type: Floppy disk drive or hard disk drive
- Drive name: For floppy disks – A, B, C, or D  
For hard disks – C, D, E, or F.  
In case a normal hard disk is installed in the system and any of the aforementioned drive names have been allocated to the V-disk boards, then the system hard disk will change to the next appropriate name.  
More than one V-disk board can be installed as a hard disk and have the same drive name. Maximum 8 boards per system.
- Base address selection

### Product Configuration



### Power Supplies

Connector CN1 is used to connect the V-Disk to optional external power supplies W-EPROM (PC) to write EPROM devices; or BU-RAM (PC) to provide battery memory backup for SRAM devices.

### Accessories

- A. Included with the board
  1. Users Manual
- B. Optional – to be ordered extra

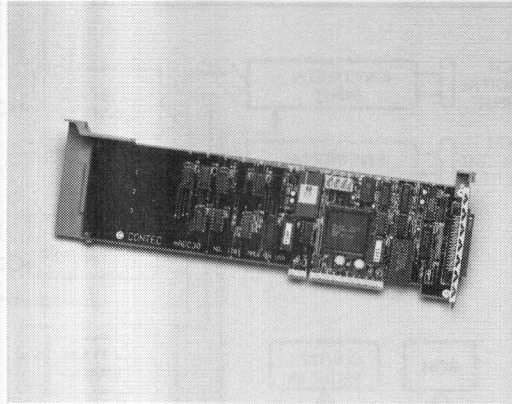
**1410016. BU-RAM**  
Battery back-up for SRAM

**1410017. W-EPROM**  
Power Supply Unit with utility software for EPROM write function



# mADC30

## Low-cost Analog Input Board



## Specifications

- Analog Inputs
  - Number of channels: 8, single-ended
  - Input Ranges:
    - Bipolar:  $\pm 5V$
    - Unipolar: 0 to 10V
  - Absolute Maximum Input Voltage:  $\pm 30V$  max.
  - Input Impedance: 1 Megohm minimum
  - A/D conversion: 12 bit resolution
  - Conversion speed: 30,000 samples/sec
  - Conversion Accuracy:  $\pm 0.04\%$  FSR at 25°C
  - Conversion Method: Successive approximation
  - Zero drift:  $\pm 40ppm$  FSR/°C
  - Data Code:
    - Straight binary (Unipolar)
    - Offset binary (Bipolar)
- Digital Input/Output
  - Number of Channels: 8 inputs, 8 outputs
  - Input Type: TTL-compatible
  - Input Load: 1 LS-TTL
  - Input Logic Levels:
    - Logic LO: 0.0 to 0.8 VDC
    - Logic HI: 2.3 to 5.0 VDC
  - Output Type: TTL-compatible
  - Fanout: Drives 20 LS-TTL loads
  - Output Logic Levels:
    - Logic LO: 0.0 to 0.8 VDC
    - Logic HI: 2.0 to 5.0 VDC
- Interrupt Signal Lines
  - Number of Interrupts: 2 (end of conversion, ext. interrupt)
  - Interrupt Level: Any one of IRQ3 to IRQ9 (except IRQ8)
  - Level Selection: Programmable
- Counter
  - Number of Counters: 3
  - Input Frequency: 10MHz (maximum)
  - Counter Length: 16 bits
  - Counter Type: BCD or Binary

## Features

- Plug-in board for IBM PS/2 Microchannel Bus
- Single-ended analog input channels
- Analog to digital conversion: 12-bit, 30,000 samples/sec
- 8 digital input and 8 digital output channels
- Programmable timer/counter
- Full interrupt handling capability

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## mADC30

### Specifications (Continued)

#### General

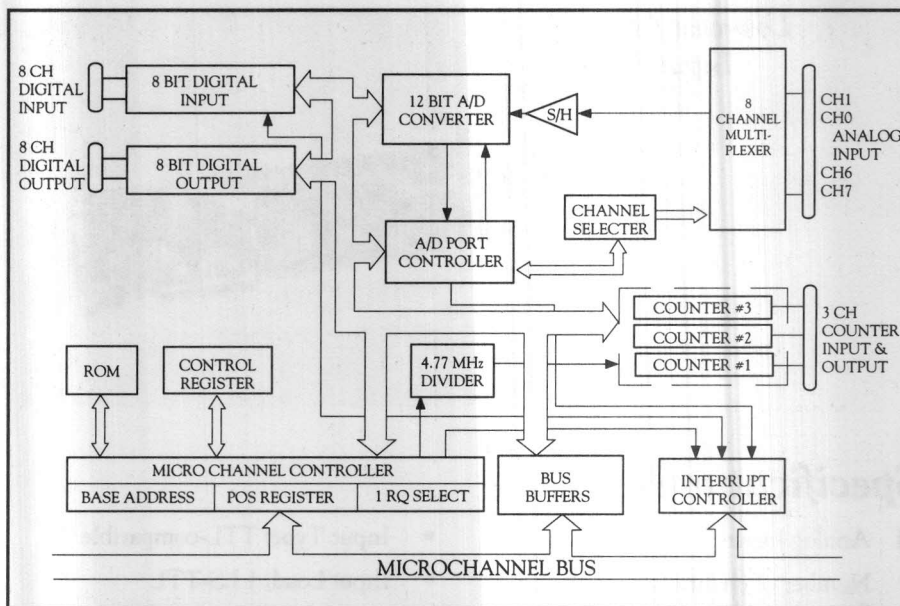
- Occupies one slot on IBM-PS/2 Microchannel bus
- I/O Port Selection: Setting POS register
- Power Consumption:  
+ 5 VDC, 800 mA  
+12V, 20mA  
-12V, 10mA
- Operating Temperature: 0 to 50°C
- Storage Temperature: -40 to 70°C
- Relative Humidity: 0 - 90%, non-condensing
- Dimensions: 3.9" x 12.7" x 0.8"
- External Connections via:  
One 68-pin I/O connector

### Functional Description

The CONTEC mADC30 is an analog/digital conversion board for the IBM PS/2 computer. When installed in the computer's expansion slots, this full-length board transforms the computer into a high-precision data acquisition and signal analysis instrument. The mADC30 board matches with the IBM Microchannel. It quickly converts analog signals into 12-bit digital data, has a built-in multipurpose I/O port, and a programmable timer/counter. The board uses an industry standard (ADC 674) 12-bit successive approximate converter to convert up to 8 single-ended analog input channels.

### Setting Up Board I/O Address

The base address of the mADC Series board is established by a software switch



which eliminates the need for configuration switches on the interface board. This board requires eight consecutive addresses for internal use. One of the 16 possible I/O addresses can be selected through the use of the System Configuration utilities on the Reference diskette. Table 1 shows the POS register address. Address lines 100H and 101H are read-only.

TABLE 1: POS REGISTER

| ADDRESS | D7                | D6   | D5   | D4   | D3   | D2   | D1  | D0  |
|---------|-------------------|------|------|------|------|------|-----|-----|
| 100H    | ID7               | ID6  | ID5  | ID4  | ID3  | ID2  | ID1 | ID0 |
| 101H    | ID15              | ID14 | ID13 | ID12 | ID11 | ID10 | ID9 | ID8 |
| 102H    | I-LV2 I-LV1 I-LV0 |      |      |      |      |      |     | CE  |
| 103H    | <---- POS1 ---->  |      |      |      |      |      |     |     |
| 104H    |                   |      |      |      |      |      |     |     |
| 105H    | CHK STAT          |      |      |      |      |      |     |     |
| 106H    |                   |      |      |      |      |      |     |     |
| 107H    |                   |      |      |      |      |      |     |     |

(IDn = board identification bit, CE = card enable POS1 = address selection field, CHK = channel check, STAT = channel check status available, FAIR = arbitration fairness, ARBn = DMA arbitration level)

### ADDRESS RELOCATION REGISTER

| MODE        | bit3 | bit2 | bit1 | bit0 |
|-------------|------|------|------|------|
| I/O ADDRESS | A13  | A12  | A8   | A4   |

### Interrupt Signals

The user can select one level of IRQ3 through IRQ9 interrupt except IRQ8. The interrupt request level can be selected at system bootup, by using the System Configuration Utilities.

### INTERRUPT LEVEL SELECTION

| INTERRUPT LEVEL | D6    | D5    | D4    |
|-----------------|-------|-------|-------|
|                 | I-LV2 | I-LV1 | I-LV0 |
| N.C.            | 0     | 0     | 0     |
| IRQ3.           | 0     | 0     | 1     |
| IRQ4.           | 0     | 1     | 0     |
| IRQ5            | 0     | 1     | 1     |
| IRQ6            | 1     | 0     | 0     |
| IRQ7            | 1     | 0     | 1     |
| IRQ9            | 1     | 1     | 0     |
| N.C.            | 1     | 1     | 1     |

Toll Free Number 1-800-888-8884

## Input/Output Port

The following tables show port register address assignments. Each register is actually located at the base address plus the offset specified. A slash indicates an unused bit.

### OUTPUT PORT

|     |                            |     |     |     |                   |     |     |     |
|-----|----------------------------|-----|-----|-----|-------------------|-----|-----|-----|
| +0H | UNUSED                     |     |     |     |                   |     |     |     |
| +1H | A/D CONVERSION             |     |     |     | CHANNEL SELECTION |     |     |     |
|     | START                      |     |     |     | CL2               | CL1 | CL0 |     |
| +2H | DIGITAL OUTPUT             |     |     |     |                   |     |     |     |
|     | OP7                        | OP6 | OP5 | OP4 | OP3               | OP2 | OP1 | OP0 |
| +3H | INTERRUPT CONTROL REGISTER |     |     |     |                   |     |     |     |
|     |                            |     |     |     |                   |     | EXT | EOC |
| +4H | COUNTER 0                  |     |     |     |                   |     |     |     |
|     | D7                         | D6  | D5  | D4  | D3                | D2  | D1  | D0  |
| +5H | COUNTER 1                  |     |     |     |                   |     |     |     |
|     | D7                         | D6  | D5  | D4  | D3                | D2  | D1  | D0  |
| +6H | COUNTER 2                  |     |     |     |                   |     |     |     |
|     | D7                         | D6  | D5  | D4  | D3                | D2  | D1  | D0  |
| +7H | CONTROL BYTE               |     |     |     |                   |     |     |     |
|     | SC1                        | SC2 | RL1 | RL0 | M3                | M1  | M0  | BCD |

### INPUT PORT

|     |                       |     |     |     |                            |     |     |     |
|-----|-----------------------|-----|-----|-----|----------------------------|-----|-----|-----|
| +0H | A/D CONVERSION DATA   |     |     |     |                            |     |     |     |
|     | D11                   | D10 | D9  | D8  | D7                         | D6  | D5  | D4  |
| +1H | D3                    | D2  | D1  | D0  |                            |     |     |     |
| +2H | DIGITAL INPUT         |     |     |     |                            |     |     |     |
|     | IP7                   | IP6 | IP5 | IP4 | IP3                        | IP2 | IP1 | IP0 |
| +3H | A/D CONVERSION STATUS |     |     |     | INTERRUPT CONTROL REGISTER |     |     |     |
|     | BUSY                  |     |     |     | 0                          | 0   | EXT | EOC |
| +4H | COUNTER 0             |     |     |     |                            |     |     |     |
|     | D7                    | D6  | D5  | D4  | D3                         | D2  | D1  | D0  |
| +5H | COUNTER 1             |     |     |     |                            |     |     |     |
|     | D7                    | D6  | D5  | D4  | D3                         | D2  | D1  | D0  |
| +6H | COUNTER 2             |     |     |     |                            |     |     |     |
|     | D7                    | D6  | D5  | D4  | D3                         | D2  | D1  | D0  |
| +7H |                       |     |     |     |                            |     |     |     |

## Interface Signal and Pin Assignment

The connections between the mADC interface board and external devices are made on the board: CN1, a 68-pin I/O connector.

### CN1 CONNECTOR

| SIGNAL NAME | PIN | PIN | SIGNAL NAME |
|-------------|-----|-----|-------------|
| CHO HI IN   | L1  | R1  | OP0         |
| ANALOG GND  | L2  | R2  | OP1         |
| CH1 HI IN   | L3  | R3  | OP2         |
| ANALOG GND  | L4  | R4  | OP3         |
| CH2 HI IN   | L5  | R5  | OP4         |
| ANALOG GND  | L6  | R6  | OP5         |
| CH3 HI IN   | L7  | R7  | OP6         |
| ANALOG GND  | L8  | R8  | OP7         |
| CH4 HI IN   | L9  | R9  | GND         |
| ANALOG GND  | L10 | R10 | IP0/INT     |
| CH5 HI IN   | L11 | R11 | IP1         |
| ANALOG GND  | L12 | R12 | IP2         |
| CH6 HI IN   | L13 | R13 | IP3         |
| ANALOG GND  | L14 | R14 | IP4         |
| CH7 HI IN   | L15 | R15 | IP5         |
| ANALOG GND  | L16 | R16 | IP6         |
| ANALOG GND  | L17 | R17 | IP7         |
|             | L18 | R18 | GND         |
|             | L19 | R19 | CLK0        |
|             | 20  | R20 | GATE0       |
|             | L21 | R21 | OUT0        |
|             | L22 | R22 | CLK1        |
|             | L23 | R23 | GATE1       |
|             | L24 | R24 | OUT1        |
|             | L25 | R25 |             |
|             | L26 | R26 | GATE2       |
|             | L27 | R27 | OUT2        |
|             | L28 | R28 |             |
|             | L29 | R29 |             |
|             | L30 | R30 |             |
|             | L31 | R31 |             |
|             | L32 | R32 |             |
|             | L33 | R33 | GND         |
|             | L34 | R34 | +5V         |

IP0/INT can be used as external interrupt.

## Programming

The mACD30 interface board is supplied with a driver for IBM BASICA, GWBASIC, Microsoft Quick BASIC, and Microsoft C language. The driver is a memory resident program running under DOS 3.x and latter. The driver provides a set of low-level and high-level functions to communicate and control external devices. User may use low-level functions to gain the most flexibility of controlling the device, or simply choose the high-level functions to reach the highest performance. A/D conversions may be made in foreground or background mode with either on-board clocking or external clocking operation. The digital I/O functions may be used in many process control applications. A frequency measurement function is designed for counting the external pulse source. All functions are invoked through a single function CALL with appropriate function number. The following is a list of all functions:

- | Function # | Description                                                                      |
|------------|----------------------------------------------------------------------------------|
| 0          | <b>Board Initialization</b><br>Initialize the board in a known state             |
| 1          | <b>Channel Selection</b><br>Select channel number to be scanned                  |
| 2          | <b>Start Conversion</b><br>Trigger an A/D conversion on the pre-selected channel |
| 3          | <b>Check Busy Flag</b><br>Reports the busy flag of current A/D conversion        |
| 4          | <b>Read A/D Data</b><br>Read the converted A/D data                              |
| 5          | <b>Set Counter Mode</b><br>Set up the counter operation mode                     |
| 6          | <b>Read Counter Mode</b><br>Read back the current counter operation mode         |



## mADC30

### Programming (Continued)

- 7 **Set Count**  
Set the initial count to a selected counter
- 8 **Read Count**  
Read the current count from a selected counter
- 9 **Set Interrupt Mask**  
Set the interrupt mask to enable or disable the interrupt on the mADC30 board.
- 10 **Read Interrupt Status**  
Read the interrupt status from mADC30 board.
- 11 **Digital Input**  
Read digital input status from mADC30 board.
- 12 **Digital Output**  
Turn on/off the digital output lines
- 13 **Synchronous A/D Conversion**  
Issue foreground A/D conversions for selected number of sweeps using on-board timer or the external clock. On each sweep the A/D conversion may scan a single channel or a number of channels in any sequence. An option can be chosen to tag the channel number to each A/D data. The function also supports ATP-M2 board, an A/D channels expansion board with programmable gain.
- 14 **Asynchronous A/D Conversion**  
Issue background A/D conversions for s selected number of sweeps using on-board timer or the external clock. The foreground program may process the collected data without interference of the A/D operation. On each trigger the A/D conversion scans the entire channel array which may contain a single channel or a number of channels in any sequence. An option can be chosen to tag the

channel number to each A/D data. The function also supports ATP-M2 board, a A/D channel expansion board with programmable gain.

- 15 **Stop Asynchronous A/D Conversion**  
Stop the background A/D conversion operation unconditionally.
- 16 **Frequency Measurement**  
Measure frequency of an unknown pulse stream using on-board counter.
- 17 **Data Transfer**  
Transfer data collected in the background A/D operation to user's data array.

B. Optional – to be ordered extra:

#### MT/68 – Cable

A 4 foot, flat cable with 68-pin male I/O connectors at either end.

#### MT/S – Cable

A 4 foot, twisted pair shielded cable with 68-pin male I/O connectors at either end.

#### MTP-2

A screw termination panel. It supports 68 screw terminals for field connections and one 68-pin I/O connector for connection to an interface board. The screw terminals accept 12 – 22AWG wires.

#### ATP-M2

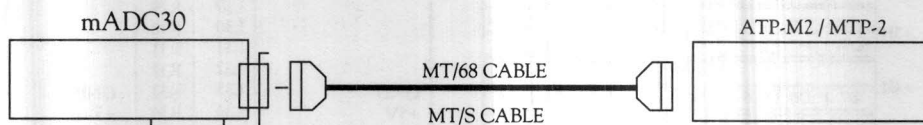
Analog input termination and multiplexer board. Multiplexes 16 differential inputs into one output. Expands input capacities of analog boards. Enables thermocouples to be connected directly for temperature measurement.

### Accessories

A. Included with board:

1. I/O-connector (loose)
2. Users Manual
3. Floppy disc with drivers and sample programs.

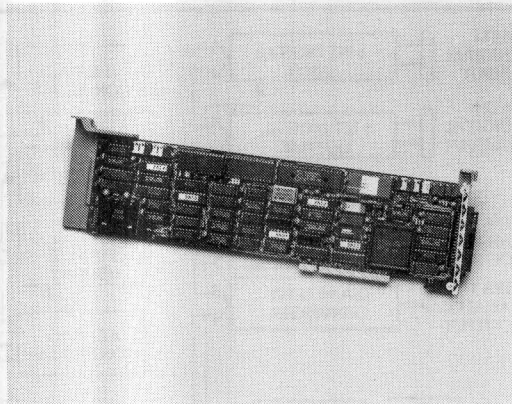
### Product Configuration



# mADC150/mADC350

**mADC150**  
**Analog Multifunction**  
**Board**

**mADC350**  
**Analog Multifunction**  
**Board with**  
**Programmable Gain**



## Specifications

- Inputs:
  - Analog inputs: 16 Single-ended/8 Differential channels
  - Full Scale Input Range: Bipolar  $\pm 10V$ ,  $\pm 5V$ ; Unipolar 0 to 10V
  - Input Gain (mADC350 only): software programmable, 1; 10; 100; 200
  - Absolute maximum input voltage:  $\pm 15V$
  - Input impedance:  $> 1$  megohm
  - A/D Conversion: 12-bit resolution, throughput 50,000 samples/sec using DMA, successive approximation
  - DMA: Software programmable
  - Accuracy:  $\pm 0.04\%$  FSR @  $25^{\circ}C$   $\pm 0.05\%$  FSR with gain/100 and 200
  - Zero Drift:  $\pm 20$  ppm of FSR/ $^{\circ}C$
  - Gain Drift:  $\pm 50$  ppm FSR/ $^{\circ}C$
  - Differential Linearity Drift:  $\pm 3$ ppm FSR/ $^{\circ}C$
- Programmable Scan Rate: 20 microseconds to 1 year
- Programmable Scan Sequence
- Output:
  - Analog outputs: 2
  - Full Scale Output Range: Jumper selectable Bipolar:  $\pm 10V$ ,  $\pm 5V$ ,  $\pm 2.5V$ ; Unipolar: 0 to 10V
  - Output current:  $\pm 5$  mA
  - Output impedance (DC): 0.2 ohm max.
  - Capacitive drive capability: 0.5 microfarad
  - D/A conversion: 12-bit resolution, throughput 30,000 samples/sec, ladder resistor network
  - Accuracy:  $\pm 0.05\%$  of FSR at  $25^{\circ}C$
  - Slew Rate: 10V/microsec
  - Settling Time to  $\pm 1/2$  LSB: 4 microseconds, 20V step
  - Thermal Characteristics:  $\pm 50$ ppm or FSR/ $^{\circ}C$

## Features

- Plug-in board for IBM PS/2 Microchannel bus
- 16 single-ended/8 differential analog input channels
- 12-bit A/D, 50,000 samples/sec using DMA
- A/D conversion options: single; multiple; cyclical scanning using internal timer; external trigger conversion
- 2 analog output channels, 12-bit D/A, 30,000 samples/sec
- Digital I/O, 8 inputs and 8 outputs
- Interrupt handling
- Programmable gain (mADC350 only)
- Programmable timer
- Programmable scan rate, 20 microsec to 1 year
- Programmable scan sequence
- Foreground/background operation
- Easy-to-use software support with drivers and sample programs

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## mADC150/mADC350

### Specifications (Continued)

#### ■ Digital I/O

Number of channels:  
8 digital input, 8 digital output

I/O Logic: TTL

- Input load: 1 LS-TTL
- Input logic level:  
Logic LO: 0.0 to 0.8VDC  
Logic HI: 2.3 to 5.0VDC
- Fan out: 20 LS-TTL
- Output logic level:  
Logic LO: 0.0 to 0.8VDC,  
sink 1.0mA  
Logic HI: 2.0 to 5.0VDC

#### ■ Timer/Counter

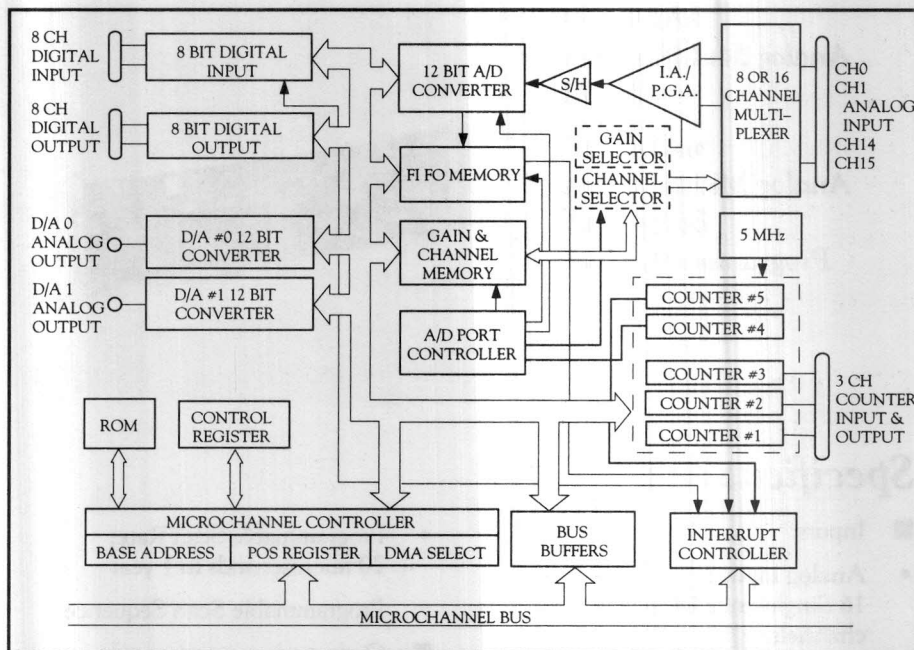
- Number of channels: 3
- Number of counters: 2
- Input frequency: DC to 5.0 MHz
- Signals: TTL-level
- Settings: 16-bit (BCD or binary)

#### ■ Interrupt Signals

- Number of interrupts: 3
- Types of signals:  
End of conversion, end of transfer,  
external interrupt
- Interrupt Level:  
Any one of IRQ3 to IRQ7 or IRQ9
- Level Selection: Programmable

#### ■ General

- Occupies one slot on IBM PS/2  
Microchannel bus
- I/O Port Selection:  
POS register setting
- Power requirements: 5 VDC, 1.5 A
- Operating temperature range:  
0 to 50 °C
- Storage temperature range:  
-40 to 70°C



- Relative humidity:  
0 to 90% non-condensing
- Dimensions: 3.9"x12.7" x 0.8"
- External connections via:  
1x 68-pin I/O-connector

### Functional Description

The mADC150 and mADC350 boards are high speed analog/digital I/O multifunction boards that match with the IBM Microchannel and are for IBM PS/2 computers. The full-length boards are identical in all respects except for the programmable gain function within the mADC350. The boards are ideal for laboratory and industrial data acquisition and control applications that require a mix of analog and digital

inputs and outputs. They provide 16 single-ended or 8 differential input channels, 2 analog output channels, 8 digital input and 8 digital output channels, and 3 channels for Timer/Counter functions. In addition, provision is made for transferring high speed data from selective or all channels through the use of Direct Memory Access (DMA). The 12-bit A/D conversion can be initiated by software, by the internal timer or by an external trigger. The conversion can be made in a single or multiple conversion, by cyclical scanning using the internal timer, or by external trigger conversion. The converted data may be collected through the software command, an interrupt service routine, or the use of DMA channels. Software also provides convenient high level commands for A/D or D/A conversion, and digital input/output.



## Input/Output Registers

The following tables show port address assignments for registers on this board. Note that the actual location of each register is at the selected base address plus the offset specified. A slash indicates an unused bit.

### INPUT PORT

|     |                              |      |     |       |                         |       |       |     |
|-----|------------------------------|------|-----|-------|-------------------------|-------|-------|-----|
| +0H | CONVERSION DATA (LOWER BYTE) |      |     |       |                         |       |       |     |
|     | D7                           | D6   | D5  | D4    | D3                      | D2    | D1    | D0  |
| +1H | CHANNEL DATA                 |      |     |       | CONVERSION DATA (UPPER) |       |       |     |
|     | CL3                          | CL2  | CL1 | CL0   | D11                     | D10   | D9    | D8  |
| +2H | A/D PORT STATUS              |      |     |       |                         |       |       |     |
|     | RD-H                         | RD-L | EOF | MULTI |                         |       |       |     |
| +3H | ID REGISTER                  |      |     |       |                         |       |       |     |
|     | ID7                          | ID6  | ID5 | ID4   | ID3                     | ID2   | ID1   | ID0 |
| +4H |                              |      |     |       |                         |       |       |     |
| +5H |                              |      |     |       |                         |       |       |     |
| +6H |                              |      |     |       |                         |       |       |     |
| +7H |                              |      |     |       |                         |       |       |     |
| +8H | Am9513 TIMER CONTROLLER      |      |     |       |                         |       |       |     |
|     | DATA REGISTER                |      |     |       |                         |       |       |     |
| +9H |                              |      |     |       |                         |       |       |     |
| +AH | Am9513 TIMER CONTROLLER      |      |     |       |                         |       |       |     |
|     | STATUS REGISTER              |      |     |       |                         |       |       |     |
| +BH |                              |      |     |       |                         |       |       |     |
| +CH | DIGITAL INPUT                |      |     |       |                         |       |       |     |
|     | IP7                          | IP6  | IP5 | IP4   | IP3                     | IP2   | IP1   | IP0 |
| +DH |                              |      |     |       |                         |       |       |     |
| +EH | INTERRUPT STATUS             |      |     |       |                         |       |       |     |
|     | DOR                          | EOT  | EXT |       | I-LV2                   | I-LV1 | I-LV0 |     |
| +FH |                              |      |     |       |                         |       |       |     |

### OUTPUT PORT

|     |                                      |      |       |     |                       |       |       |
|-----|--------------------------------------|------|-------|-----|-----------------------|-------|-------|
| +0H | CHANNEL SELECT                       |      |       |     | GAIN SELECT           |       |       |
|     | CL3                                  | CL2  | CL1   | CL0 | X200                  | X100  | X10   |
| +1H | MODE SELECT                          |      |       |     | CHANNEL MEMORY SELECT |       |       |
|     | M/S                                  | EXT  | TIMER | DMA | CT3                   | CT2   | CT1   |
| +2H | A/D CONVERSION CONTROL               |      |       |     |                       |       |       |
|     | START                                | STOP | CLEAR |     |                       |       | CHSET |
| +3H |                                      |      |       |     |                       |       |       |
| +4H | D/A CONVERTER (LOWER BYTE) 0 CHANNEL |      |       |     |                       |       |       |
|     | D7                                   | D6   | D5    | D4  | D3                    | D2    | D1    |
| +5H | D/A CONVERTER (UPPER BYTE) 0 CHANNEL |      |       |     |                       |       |       |
|     |                                      |      |       |     | D11                   | D10   | D9    |
| +6H | D/A CONVERTER (LOWER BYTE) 1 CHANNEL |      |       |     |                       |       |       |
|     | D7                                   | D6   | D5    | D4  | D3                    | D2    | D1    |
| +7H | D/A CONVERTER (UPPER BYTE) 1 CHANNEL |      |       |     |                       |       |       |
|     |                                      |      |       |     | D11                   | D10   | D9    |
| +8H | Am9513 TIMER CONTROLLER              |      |       |     |                       |       |       |
|     | DATA REGISTER                        |      |       |     |                       |       |       |
| +9H |                                      |      |       |     |                       |       |       |
| +AH | Am9513 TIMER CONTROLLER              |      |       |     |                       |       |       |
|     | COMMAND REGISTER                     |      |       |     |                       |       |       |
| +BH |                                      |      |       |     |                       |       |       |
| +CH | DIGITAL OUTPUT                       |      |       |     |                       |       |       |
|     | OP7                                  | OP6  | OP5   | OP4 | OP3                   | OP2   | OP1   |
| +DH |                                      |      |       |     |                       |       |       |
| +EH | INTERRUPT CONTROL                    |      |       |     |                       |       |       |
|     | DOR                                  | EOT  | EXT   |     | I-LV2                 | I-LV1 | I-LV0 |
| +FH |                                      |      |       |     |                       |       |       |

## POS Registers and Jumpers

The POS registers are used in the Microchannel to partially eliminate the need for configuration switches on the adapter card. These registers function as software-settable switches and establish other board parameters to avoid conflict. Microchannel bus arbitration protocol enables DMA transfer. The following tables show the POS register addresses.

| ADDRESS | D7                 | D6   | D5                       | D4   | D3   | D2   | D1  | D0  |
|---------|--------------------|------|--------------------------|------|------|------|-----|-----|
| 100H    | ID7                | ID6  | ID5                      | ID4  | ID3  | ID2  | ID1 | ID0 |
| 101H    | ID15               | ID14 | ID13                     | ID12 | ID11 | ID10 | ID9 | ID8 |
| 102H    |                    |      |                          |      |      |      |     | CE  |
| 103H    | <----- POS1 -----> |      |                          |      |      |      |     |     |
| 104H    |                    |      |                          |      |      |      |     |     |
| 105H    | CHK                | STAT | FAIR ARB3 ARB2 ARB1 ARB0 |      |      |      |     |     |
| 106H    |                    |      |                          |      |      |      |     |     |
| 107H    |                    |      |                          |      |      |      |     |     |

(IDn = board identification bit, CE = card enable POS1 = address selection field, CHK = channel check, STAT = channel check status available, FAIR = arbitration fairness, ARBn = DMA arbitration level)

## A/D Converter

The A/D converter has three ports at the base address. The low order byte (D0-D7) of the 12-bit converted data occupies the first port, while the remaining bits (D8-D11) are in the four least significant positions of the second port. The status bits RD-H and RD-L at the port will be set when the converted data is ready to read, and then reset after the converted data is read. The conversion mode, read mode and channel selection can be selected by setting the proper bits at these three ports.

## Setting Up I/O Board Address

This board requires 16 consecutive addresses. The base address can be set using the POS register which is programmable.

## Analog Input/Output Range Settings

The range settings required for inputs and outputs are made via jumpers on the board, e.g. Single-ended/Differential, Unipolar/Bipolar, and Range.

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## mADC150/mADC350

### D/A Converter

The D/A converter occupies two ports per channel at the base address. The low order byte of output data must be sent to the low order port, and the upper four bits to the four least significant positions of the port. Each D/A channel has a different base address.

### Operation Mode Selection

The mode selection can be made by software.

#### Data Coding Example

For analog-to-digital and digital-to-analog conversion, the following formulas convert the corresponding digital word to the voltage level:

Bipolar:

$$\text{Voltage} = \frac{\text{Digital value} - 2048}{4096} \times \text{F.S.R.}$$

Unipolar:

$$\text{Voltage} = \frac{\text{Digital value}}{4096} \times \text{F.S.R.}$$

Where F.S.R. = Full Scale Range

For example, if the voltage range is  $\pm 5$  volts bipolar and the digital value is 3500 (DACH), the corresponding analog voltage is as follows:

$$\begin{aligned} \text{Voltage} &= \frac{3500 - 2048}{4096} \times \text{F.S.R.} \\ &= \frac{1452 \times 10}{4096} \\ &= 3.5049 \text{ volts} \end{aligned}$$

### Interface Signal and Pin Assignment

The connections between the ADC interface board and external devices are made by one 68-pin, I/O connector on the board: CN1.

| SIGNAL NAME | PIN | PIN | SIGNAL NAME |
|-------------|-----|-----|-------------|
| CH0 HI IN   | L1  | R1  | OP0         |
| CH8 LO IN   | L2  | R2  | OP1         |
| CH1 HI IN   | L3  | R3  | OP2         |
| CH9 LO IN   | L4  | R4  | OP3         |
| CH2 HI IN   | L5  | R5  | OP4         |
| CH10 LO IN  | L6  | R6  | OP5         |
| CH3 HI IN   | L7  | R7  | OP6         |
| CH11 LO IN  | L8  | R8  | OP7         |
| CH4 HI IN   | L9  | R9  | GND         |
| CH12 LO IN  | L10 | R10 | IP0/INT     |
| CH5 HI IN   | L11 | R11 | IP1         |
| CH13 LO IN  | L12 | R12 | IP2         |
| CH6 HI IN   | L13 | R13 | IP3         |
| CH14 LO IN  | L14 | R14 | IP4         |
| CH7 HI IN   | L15 | R15 | IP5         |
| CH15 LO IN  | L16 | R16 | IP6         |
| ANALOG GND  | L17 | R17 | IP7         |
| A-OUT CH0   | L18 | R18 | GND         |
| ANALOG GND  | L19 | R19 | CLK3        |
| A-OUT CH1   | L20 | R20 | GATE3       |
| ANALOG GND  | L21 | R21 | OUT3        |
| +10V REF    | L22 | R22 | CLK2        |
|             | L23 | R23 | GATE2       |
| EXT TRIG    | L24 | R24 | OUT2        |
|             | L25 | R25 |             |
|             | L26 | R26 | GATE1       |
|             | L27 | R27 | OUT1        |
|             | L28 | R28 |             |
|             | L29 | R29 |             |
|             | L30 | R30 |             |
|             | L31 | R31 |             |
|             | L32 | R32 |             |
| GND         | L33 | R33 | GND         |
| +5V         | L34 | R34 | +5V         |

IP0/INT can be used as external interrupt.

### Programming

The mADC150 and mADC350 interface boards are supplied with a driver for IBM BASICA, GWBASIC, Microsoft QuickBASIC, and Microsoft C language. The driver is a memory resident program running under DOS 3.x and latter. The driver provides a set of low-level and high-level functions to communicate and control external devices. User may use low-level functions to reach the highest performance of the board. A/D conversions may be made in foreground or background mode with either on-board clocking or external clocking operation. To reach the highest sampling speed, DMA

transfer can be selected with foreground or background operation. The digital I/O functions may be used in many process control applications. A frequency measurement function and a pulse generation function can be used for event counting and wave generation. All functions are invoked through a single function CALL with appropriate function number. The following is a list of all functions:

| Function # | Description                                                                                                                                                                     |
|------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 0          | <b>Board initialization</b><br>Initialize the board in a known state                                                                                                            |
| 1          | <b>Channel and Gain Selection</b><br>Select channel number to be scanned and set the gain code if mADC350 board is used                                                         |
| 2          | <b>Set Channel/Gain Register</b><br>Set Channel number and gain code to the Channel/Gain registers                                                                              |
| 3          | <b>Select A/D Mode and Channel Registers</b><br>Select A/D conversion mode and set the total number of the Channel/Gain registers to be used for the subsequent A/D conversions |
| 4          | <b>Start A/D Conversion</b><br>Start the A/D conversion with the pre-selected mode                                                                                              |
| 5          | <b>Stop A/D Conversion</b><br>Stop the current A/D conversion                                                                                                                   |
| 6          | <b>Clear FIFO memory</b><br>Flush the FIFO data buffer                                                                                                                          |
| 7          | <b>Check Status</b><br>Reports data ready status, end-of-transfer flag and multiple conversion flag.                                                                            |
| 8          | <b>Read Data</b><br>Read single A/D data from the board                                                                                                                         |
| 9          | <b>Setup DMA</b><br>Setup DMA controller for subsequent A/D data transfer                                                                                                       |
| 10         | <b>Single D/A Conversion</b><br>Issue a single D/A conversion through the selected analog output channel                                                                        |

## Programming (Continued)

- 11 **Digital Output in Byte**  
Issue digital output in byte format
- 12 **Digital Input in Byte**  
Read digital input lines in byte format
- 13 **Set Interrupt Mask**  
Set interrupt mask to the interrupt control register on the board
- 14 **Check Interrupt Status**  
Report interrupt status on the board
- 15 **Set A/D Conversion Clock**  
Set up A/D conversion timer speed
- 16 **Set Counter Mode**  
Set up the counter operation mode
- 17 **Read Counter Mode**  
Read back the current counter operation mode
- 18 **Set Count**  
Set the initial count to a selected counter
- 19 **Read Count**  
Read the current count from a selected counter
- 20 **Synchronous A/D Conversion**  
Issue a foreground A/D conversion for a selected number of sweeps using on-board timer or the external clock. On each sweep the A/D conversion may scan a single channel or a number of channels in any sequence.
- 21 **Asynchronous A/D Conversion**  
Issue background A/D conversions for a selected number of sweeps using on-board timer or the external clock. The foreground program may process the collected data without interference of the A/D operation. On each trigger the A/D conversion scans the entire channel array which may contain a single channel or a number of channels in any sequence.
- 22 **Stop Asynchronous A/D Conversion**  
Stop the background A/D conversion operation unconditionally.

- 23 **Data Transfer**  
Transfer data collected in the background A/D operation to user's data array.
- 24 **Synchronous D/A Conversion**  
Issue a foreground D/A conversion for a selected number of sweeps using on-board timer or external clock. On each timer interval, the data in the data array will be sent to the selected analog output channel(s).
- 25 **Asynchronous D/A Conversion**  
Issue background D/A conversions for a selected number of sweeps using on-board timer or the external clock. On each timer interval, the data in the data array will be sent to the selected analog output channel(s). The foreground program may work on any process without interference.
- 26 **Stop Asynchronous D/A Conversion**  
Stop the background D/A conversion operation unconditionally.
- 27 **Frequency Measurement**  
Measure frequency of an unknown pulse stream using on-board counter.
- 28 **Pulse Measurement**  
Measure pulse width of an unknown signal stream using on-board counter.

## Accessories

### A. Included with board:

1. I/O-connector (loose)
2. Users Manual
3. Floppy disc with drivers and sample programs.

### B. Optional – to be ordered extra:

#### MT/68 – Cable

A 4 foot, flat cable with 68-pin male I/O connectors at either end.

#### MT/S –Cable

A 4 foot, shielded cable with 68-pin male I/O connectors at either end.

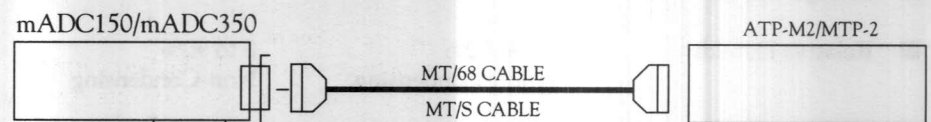
#### MTP-2

A screw termination panel. It supports 68 screw terminals for field connections and one 68-pin I/O connector for connection to an interface board. The screw terminals accept 12 – 22AWG wires.

#### ATP-M2

Analog input termination and multiplexer board. Multiplexes 16 differential inputs into one output. Expands input capacities of analog boards. Enables thermocouples to be connected directly for temperature measurement.

## Product Configuration

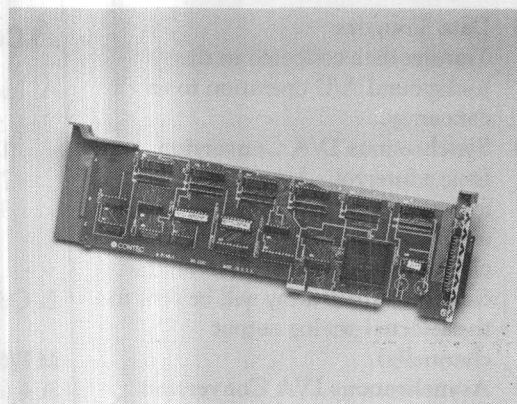




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# mPI48

## 48-Channel Digital Input Boards



## Features

- Plug-in board for IBM PS/2 Microchannel bus
- 48 digital input channels
- TTL compatible inputs (mPI48-T)
- Opto-isolated inputs (mPI48-L)
- Four interrupt lines
- Software selectable base address and interrupt level
- Easy to use software

## Specifications

| Product Name                                     | mPI48-T                    | mPI48-L                    |
|--------------------------------------------------|----------------------------|----------------------------|
| ■ Number of Inputs                               | 48                         | 48                         |
| ■ Input Type                                     | TTL                        | Opto-isolated              |
| ■ Isolation Voltage                              | —                          | 2500 V <sub>RMS</sub>      |
| ■ Throughput Time                                | 1μs max.                   | 1ms max.                   |
| ■ Input Resistance                               | 7 Kohm                     | 2 Kohm<br>612mA            |
| ■ Power Consumption                              | 5VDC<br>1.21A max.         | 5VDC<br>1.21A max.         |
| ■ External Power Supply                          | —                          | 12-24 VDC                  |
| ■ Interrupts                                     | 4                          | 4                          |
| ■ Operating Temperature                          | 0 to 50°C                  | 0 to 50°C                  |
| ■ Storage Temperature                            | -20 to 70°C                | -20 to 70°C                |
| ■ Relative Humidity                              | 0 to 90%<br>Non-Condensing | 0 to 90%<br>Non-Condensing |
| ■ Dimensions                                     | 4.2" x 12.5" x 1.0"        | 4.2" x 12.5" x 1.0"        |
| ■ Occupies one slot on IBM PS/2 Microchannel bus |                            |                            |

**Toll Free Number 1-800-888-8884**

## Specifications (Continued)

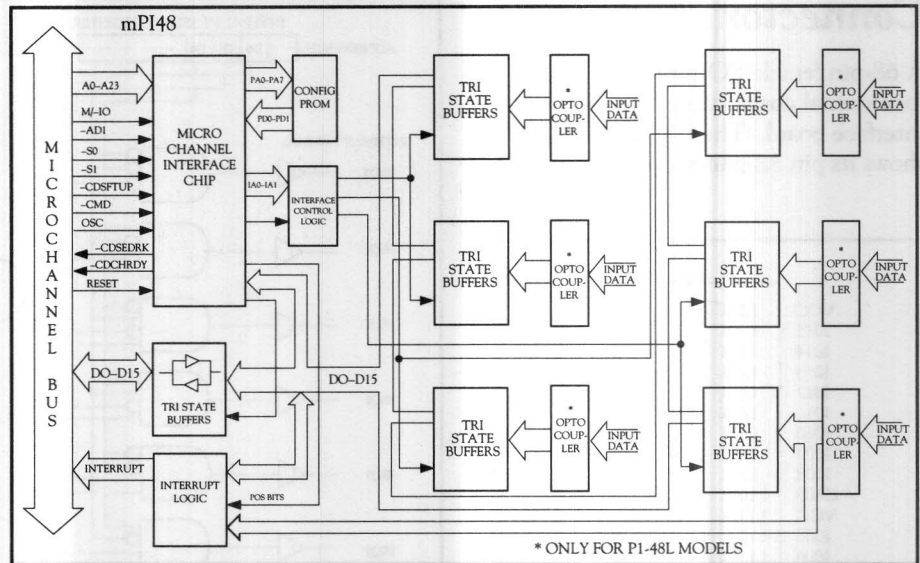
- Address Selection:  
Any 4-byte boundary
- External Connections: Via one  
68-pin I/O Connector

## Functional Description

The CONTEC mPI48 is a 48 channel digital input interface board for data acquisition and control for IBM PS/2 computers and compatibles. The boards are available in TTL-level (mPI48-T) or opto-isolated (mPI48-L) versions. These boards are flexible in use and provide a wide variety of applications for parallel inputs from devices such as instruments, user designed systems and signal control equipment. The base address and interrupt level are software selectable. The board occupies eight port addresses which are mapped directly to the IBM Microchannel bus, making the boards easy to use.

## Base Address

The base address of the interface board is software selectable and requires eight consecutive addresses for its internal use. Input channels 0-7 are located at base address +0H, and input channels 8-15 are at base address +1H, and so on.



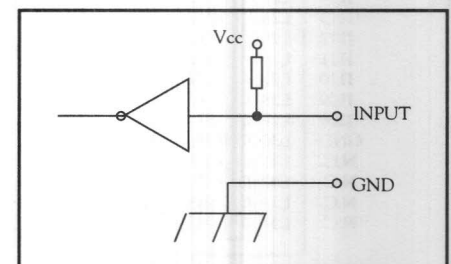
## Interrupt Registers

mPI48 interface boards provide four interrupt lines to connect with external devices for the event-driven applications. Input channels 0-3 on ports "0" can be used for this purpose.

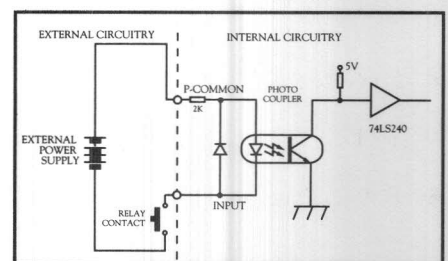
## I/O Port Address

Software selectable 280H, 290H, 380H, 390H, 1280H, 1290H, 1380H, 1390H, 2280H, 2290H, 2380H, 2390H, 3280H, 3290H, 3380H, 3390H.

## Input Circuitry TTL LEVEL mPI48T



## OPTO-ISOLATED mPI48L

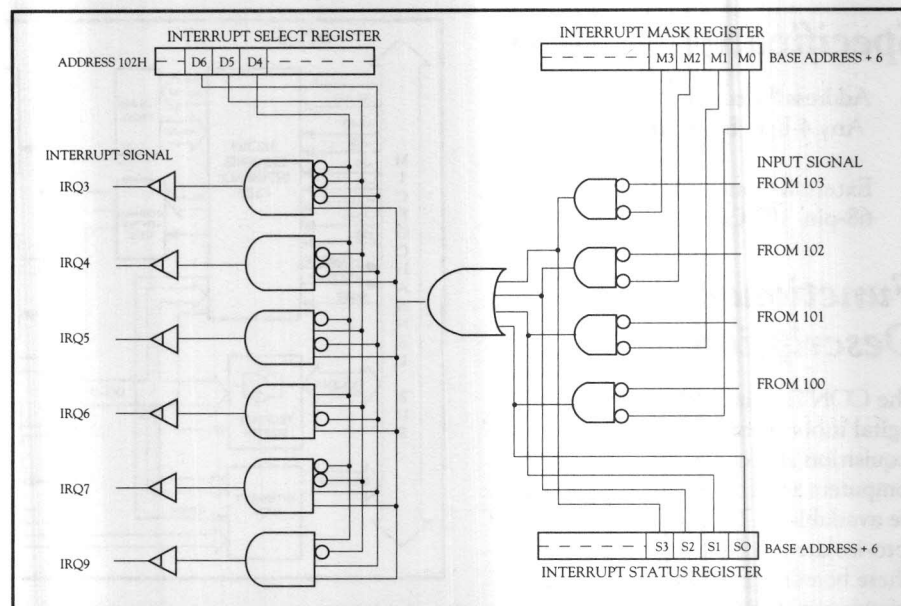
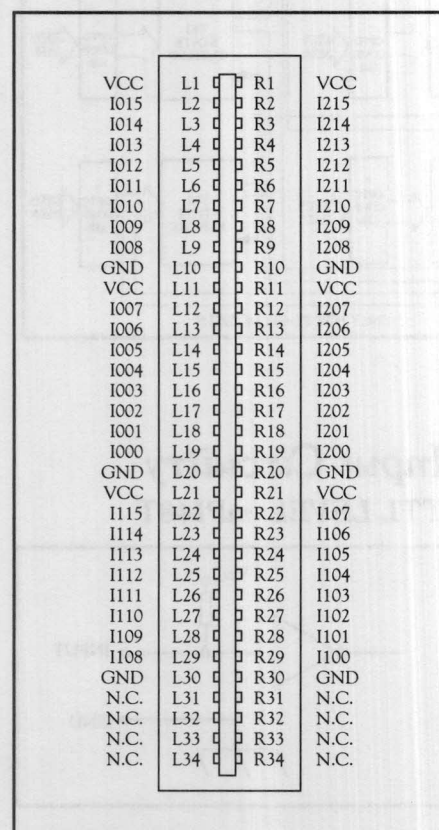


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## mPI48

### Connector

A 68-pin female I/O connector is used for external connection to the mPI48 interface board. The following diagram shows its pin assignments:



### Programming

The mPI48 interface boards lend themselves to easy programming with I/O instructions in any application language.

The mPI-48T/L boards are also supplied with a driver which can be accessed from IBM BASICA, GWBASIC, Microsoft QuickBASIC and Microsoft C language. The driver is a memory resident program running under DOS 3.x and latter. The driver provides a set of high-level functions to communicate and control external device. All functions are invoked through a single function CALL with appropriate function number. The following is a list of all functions:

| Function #                    | Description                                                       |
|-------------------------------|-------------------------------------------------------------------|
| 0 <b>Board Initialization</b> | Initialize the board in a known state                             |
| 1 <b>Bit Input</b>            | Read the input status from a selected input line.                 |
| 2 <b>Byte Input</b>           | Read the input status from a selected 8-bit input port.           |
| 3 <b>Word Input</b>           | Read the input status from a selected 16-bit input port.          |
| 4 <b>Input All at Once</b>    | Read the input status from all input lines at same time.<br>wires |



## Accessories

### A. Included with Board

1. I/O Connector (loose)
2. Users Manual
3. Floppy disk containing sample programs

### B. Optional – to be ordered extra

#### MT/68 Cable

A 4 foot, flat cable with 68-pin male I/O connectors at either end.

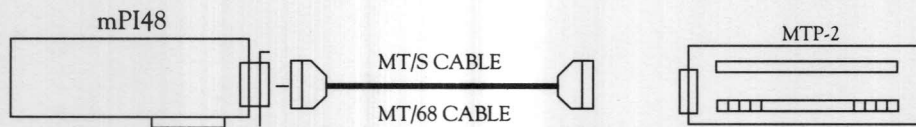
#### MT/S

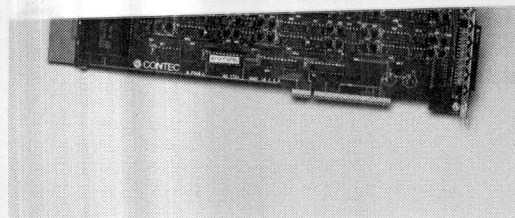
A 4 foot, shielded cable with 68-pin male I/O connectors at either end.

#### MTP-2

A screw termination panel. It supports 68 screw terminals for field connections and one 68-pin I/O connector for connection to an interface board. The screw terminals accept 12 – 22 AWG.

## Product Configuration





- High fanout TTL compatible outputs (mPO48-T)
- Opto-isolated outputs (mPO48-L)
- Software selectable base address
- Easy to use software

## Specifications

| Product Name            | mPO48-T                    | mPO48-L                    |
|-------------------------|----------------------------|----------------------------|
| ■ Outputs               | 48                         | 48                         |
| ■ Type                  | TTL                        | Opto-isolated              |
| ■ Isolation Voltage     | —                          | 2500 VRMS                  |
| ■ Throughput Time       | 1 $\mu$ s max.             | 1ms max.                   |
| ■ Output Level          | 5VDC                       | 12 – 24 VDC                |
| ■ Sink Current          | 40 mA max.                 | 200 mA                     |
| ■ Power Consumption     | 5VDC<br>1.2A max.          | 5 VDC<br>850mA max.        |
| ■ External Power Supply | —                          | 12 – 24 VDC                |
| ■ Operating Temperature | 0 – 50°C                   | 0 – 50°C                   |
| ■ Storage Temperature   | –20 to 70°C                | –20 to 70°C                |
| ■ Relative Humidity     | 0 to 90%<br>Non-Condensing | 0 to 90%<br>Non-Condensing |
| ■ Dimensions            | 4.2" x 12.5" x 1.0"        | 4.2" x 12.5" x 1.0"        |

**Toll Free Number 1-800-888-8884**

## Specifications (Continued)

- Occupies one slot on IBM PS/2 Microchannel bus
- Address Selection:  
Any 4-byte boundary
- External Connections:  
Via one 68-pin D-type Connector

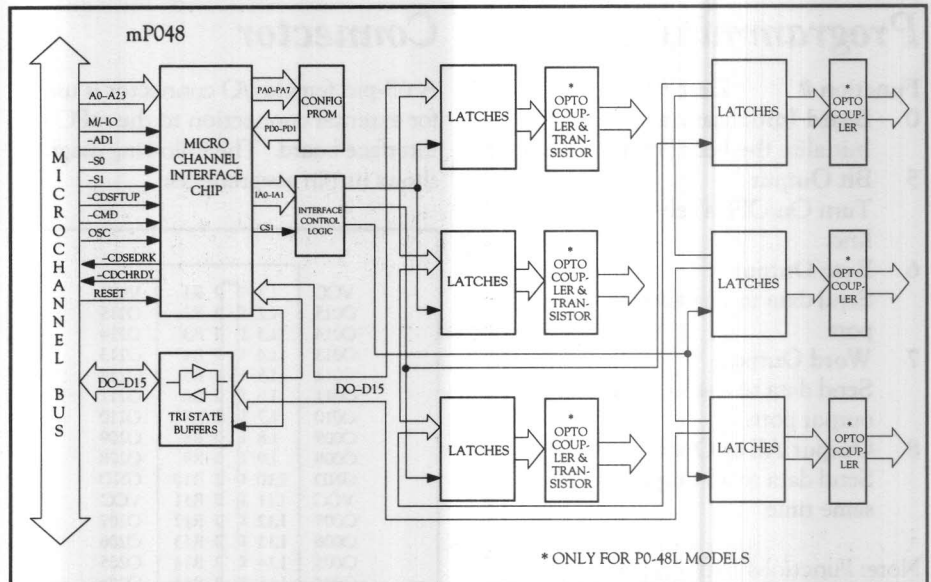
## Functional Description

The CONTEC mPO48 is a 48 channel digital output interface board for data acquisition and control for IBM PS/2 computers and compatibles. The boards are available in TTL-level (mPO48-T) and opto-isolated (mPO48-L) output versions. These boards are flexible in use and provide a wide variety of applications for the parallel output operations to control devices such as instruments, user designed systems and signal control equipment. The opto-isolated type is particularly suitable for a severe industrial environment. The base address of the I/O port can be selected by software. The board occupies eight port addresses which are mapped directly to the IBM Microchannel bus, making the boards easy to use.

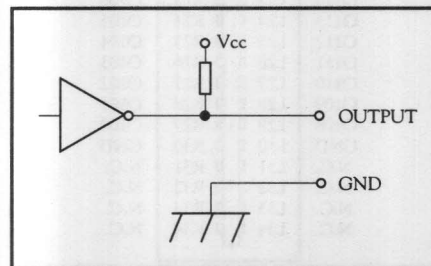
## Base Address

The base address of the interface board is software selectable and requires eight consecutive addresses for its internal use.

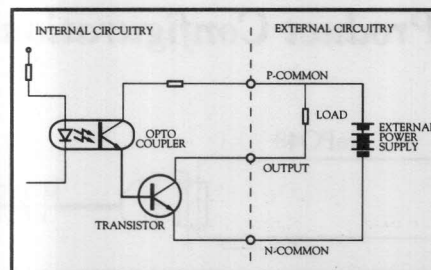
Output channels 0-7 are located at base address +0H, and output channels 8-15 are at base address +1H, and so on.



## OUTPUT CIRCUITRY TTL LEVEL



## OPTO-ISOLATED



## I/O Port Address

Software selectable 280H, 290H, 380H, 390H, 1280H, 1290H, 1380H, 1390H, 2280H, 2290H, 2380H, 2390H, 3280H, 3290H, 3380H, 3390H.

## Programming

The mPO48 interface boards lend themselves to easy programming with I/O instructions in any application language.

The mPO-48T/L boards are also supplied with a driver which can be accessed from IBM BASICA, GWBASIC, Microsot QuickBASIC, and Microsoft C language. The provides a set of high-level functions to communicate and control external devices. All functions are invoked through a single function CALL with appropriate function number. The following is a list of all functions:



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## mPO48

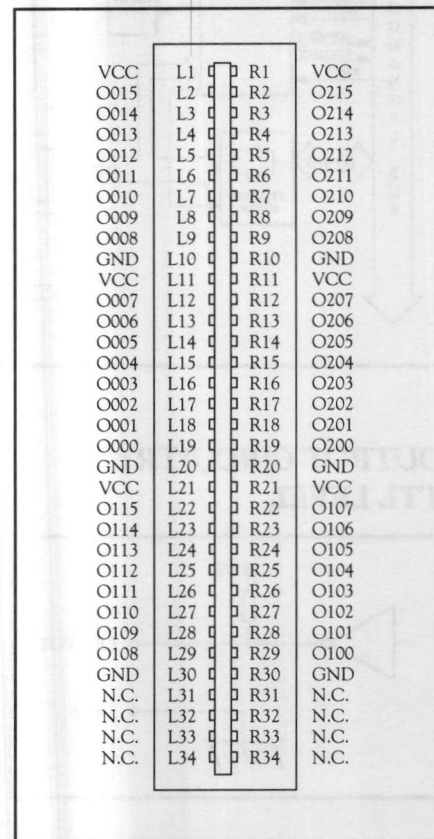
### Programming (Continued)

| Function # | Description                                                             |
|------------|-------------------------------------------------------------------------|
| 0          | <b>Board Initialization</b><br>Initialize the board in a known state    |
| 5          | <b>Bit Output</b><br>Turn On/OFF a selected output line.                |
| 6          | <b>Byte Output</b><br>Send data to a selected 8-bit output port         |
| 7          | <b>Word Output</b><br>Send data to a selected 16-bit output port.       |
| 8          | <b>Output All at Once</b><br>Send data to all output lines at same time |

Note: Functions 1 to 4 are reserved for mPI48 and mPIO24/24 boards.

### Connector

A 68-pin female I/O connector is used for external connection to the mPO48 interface board. The following diagram shows its pin assignments:



### Accessories

#### A. Included with Board

1. I/O-type Connector (loose)
2. Users Manual
3. Floppy disk containing sample programs

#### B. Optional – to be ordered extra

##### MT/68 Cable

A 4 foot, flat cable with 68-pin male I/O connectors at either end.

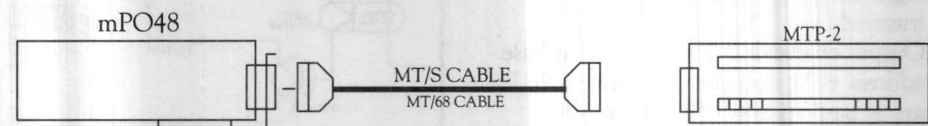
##### MT/S Cable

A 4 foot shielded cable with 68-pin male I/O connectors at either end.

##### MTP-2

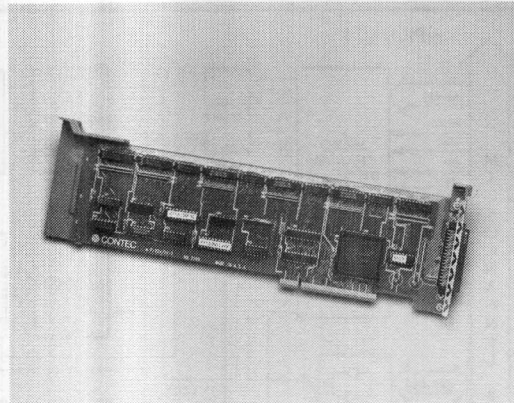
A screw termination panel. It supports 68 screw terminals for field connections and one 68-pin I/O connector for connection to an interface board. The screw terminals accept 12 – 22 AWG wires.

### Product Configuration



# mPIO24/24

## 24/24 Channel Digital Input/Output Boards



## Specifications

| Product Name            | mPIO24/24-T                | mPIO24/24-L                |
|-------------------------|----------------------------|----------------------------|
| ■ Inputs                | 24                         | 24                         |
| ■ Outputs               | 24                         | 24                         |
| ■ Type                  | TTL                        | Opto-isolated              |
| ■ Isolation Voltage     | —                          | 2500 V <sub>RMS</sub>      |
| ■ Throughput Time       | 1μs max.                   | 1ms max.                   |
| ■ Input Resistance      | 7 Kohm                     | 2 Kohm                     |
| ■ Output Level          | 5VDC                       | 12–24VDC                   |
| ■ Sink Current          | 40mA max.                  | 200mA                      |
| ■ Power Consumption     | 5VDC<br>1.26A max.         | 5VDC<br>1.18A max.         |
| ■ External Power Supply | —                          | 12–24 VDC                  |
| ■ Interrupts            | 4                          | 4                          |
| ■ Operating Temperature | 0 to 50°C                  | 0 to 50°C                  |
| ■ Storage Temperature   | –20 to 70°C                | –20 to 70°C                |
| ■ Relative Humidity     | 0 to 90%<br>Non-Condensing | 0 to 90%<br>Non-Condensing |
| ■ Dimensions            | 3.5" x 12.5" x 1.0"        | 3.5" x 12.5" x 1.0"        |

## Features

- Plug-in board for IBM PS/2 Microchannel bus
- 24 digital input and 24 digital output channels
- High TTL fanout (mPIO24/24T)
- Opto-isolated inputs and outputs (mPIO24/24L)
- Four interrupt lines
- Software selectable base address and interrupt level
- Easy to use software

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## mPIO24/24

### Specifications (Continued)

- Occupies one slot on IBM PS/2 Microchannel bus
- Address Selection:  
Any 8-byte boundary
- External Connections:  
Via one 68-pin connector

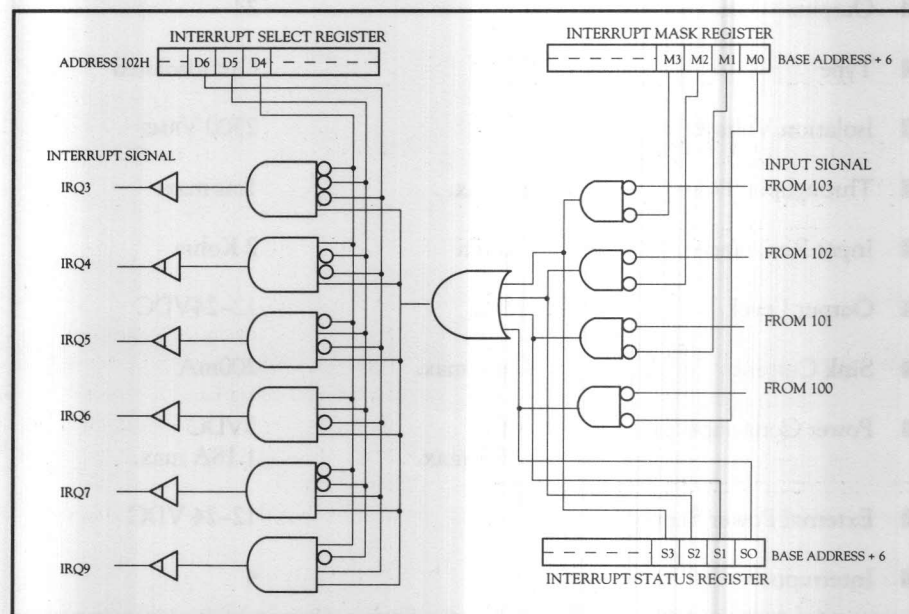
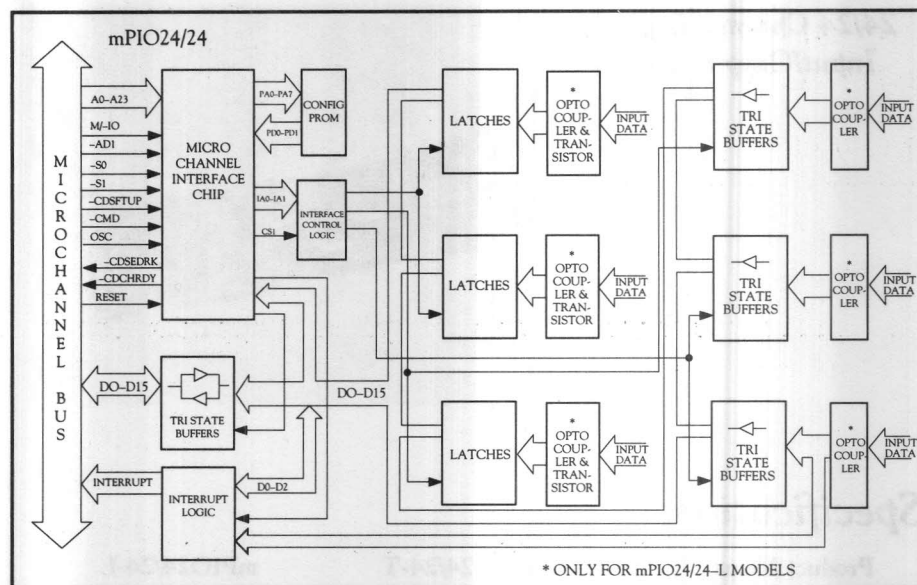
### Functional Description

The CONTEC mPIO24/24 is a digital input/output interface board for data acquisition and control for IBM PS/2 computers and compatibles. It provides 24 inputs and 24 outputs on a single board. The boards are available in TTL-level (mPIO24/24T) or opto-isolated (mPIO24/24L) input/output versions. These boards are flexible in use and provide a wide variety of applications for parallel input/output from devices such as instruments, user designed systems and signal control equipment. The base address of the I/O port can be selected by software. The board occupies four port addresses which are mapped directly to the IBM Microchannel bus, making the boards easy to use.

### Base Address

The base address of the interface board is software selectable and requires eight consecutive addresses for its internal use.

The three input ports (24 input channels) and three output ports (24 output channels) share the same base address. The input/output channels 0-7 are located at base address +0H, input/output channels 8-15 are at base address +1H and 16-24 at +2H respectively.



### Interrupt Level

mPIO24/24 interface boards provide four interrupt lines to support real-time applications. Input channels 0 - 3 on port 0 can be used for this purpose.

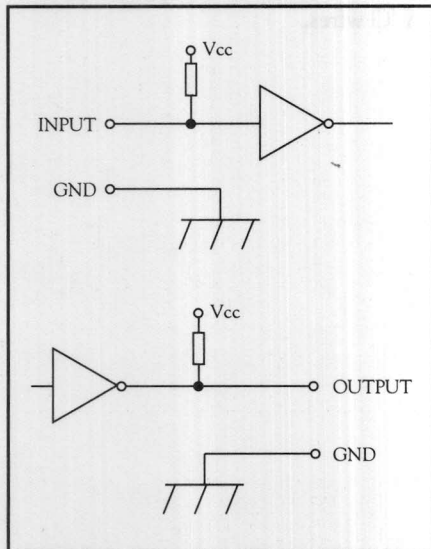
### I/O Port Address

Software selectable 280H, 290H, 380H, 390H, 1280H, 1290H, 1380H, 1390H, 2280H, 2290H, 2380H, 2390H, 3280H, 3290H, 3380H, 3390H.

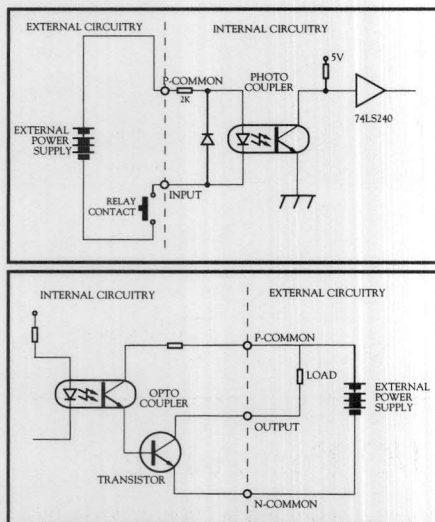


## Input/Output Circuitry

### TTL-LEVEL I/O mPIO24/24T



### OPTO-ISOLATED I/O mPIO24/24



## Programming

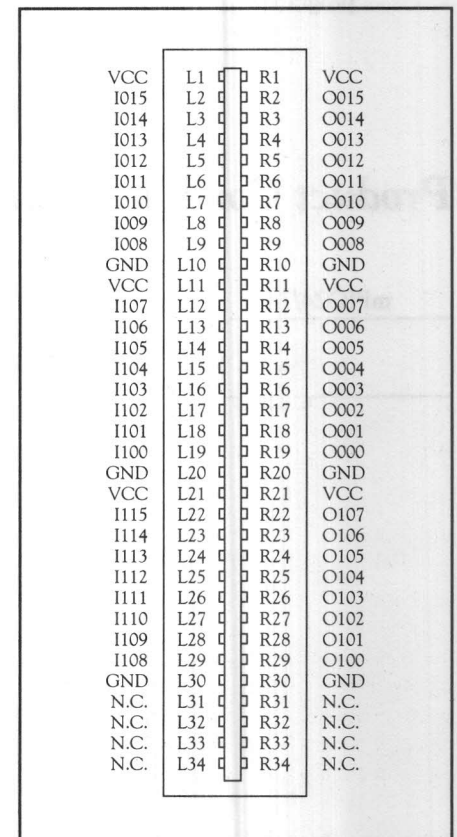
The mPIO24/24 interface boards lend themselves to easy programming with I/O instructions in any application language.

The mPIO24/24T/L boards are also supplied with a driver which can be accessed from IBM BASICA, GWBASIC, Microsoft QuickBASIC, and Microsoft C language. The driver is a memory resident program running under DOS 3.x and latter. The driver provides a set of high-level functions to communicate and control external devices. All functions are invoked through a single function CALL with appropriate function number. The following is a list of all functions:

- | Function # | Description                                                                          |
|------------|--------------------------------------------------------------------------------------|
| 0          | <b>Board Initialization</b><br>Initialize the board in a known state                 |
| 1          | <b>Bit Input</b><br>Read the input status from a selected input line.                |
| 2          | <b>Byte Input</b><br>Read the input status from a selected 8-bit input port.         |
| 3          | <b>Word Input</b><br>Read the input status from a selected 16-bit input port.        |
| 4          | <b>Input All at Once</b><br>Read the input status from all input lines at same time. |
| 5          | <b>Bit Output</b><br>Turn ON/OFF a selected output line.                             |
| 6          | <b>Byte Output</b><br>Send data to a selected 8-bit output port.                     |
| 7          | <b>Word Output</b><br>Send data to a selected 16-bit output port.                    |
| 8          | <b>Output all at Once</b><br>Send data to all output lines at same time.             |

## Connector

A 68-pin male connector is used for external connection to the mPIO24/24 interface board. The following diagram shows its pin assignments:



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## mPIO24/24

### Accessories

#### A. Included with Board

1. I/O-Connector (loose)
2. Users Manual
3. Floppy disk containing sample programs

#### B. Optional – to be ordered extra

##### MT/68 Cable

A 4 foot flat cable with 68-pin male I/O connectors at either end

##### MT/S Cable

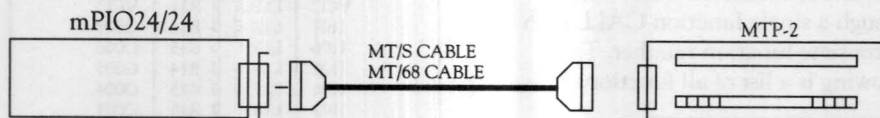
A 4 foot twisted pair shielded cable with 68-pin male I/O connectors at either end.

##### MTP-2

A screw termination panel. it supports 68 screw terminals for field connections and one 68-pin I/O connector for connection to an interface board.

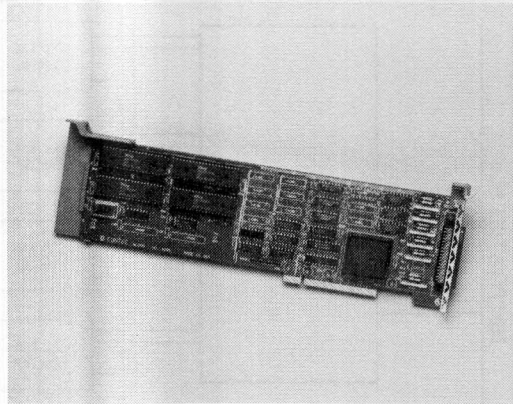
The screw terminals accept 12 – 22 AWG wires.

### Product Configuration



# mCOM8A/mCOM8B

**8-Channel  
RS232/RS422  
Communication Boards**



## Specifications

### ■ Communication

- Input Type: mCOM8A - RS232C  
mCOM8B - RS-422
- Number of Channels: 8 channels
- Baud Rate: 75 - 38,400 bps
- Data Buffer: 1 character/channel
- Data Word Length: 5, 6, 7, or 8 bits
- Stop Bits: 1, 1.5 or 2 bits
- Parity: Even, Odd or None
- UART IC: Z85C30

### ■ Interrupt Signals

Any one level IRQ3 - IRQ7

### ■ I/O Port Addresses

Software selectable: 200H, 300H,  
1200H, 1300H, 2200H, 2300H,  
3200H or 3300H, occupies 32 bytes  
(20H bytes)

### ■ General

- Occupies one slot on IBM PS/2  
Microchannel bus
- Power consumption:
 

|         | mCOM8A     | mCOM8B      |
|---------|------------|-------------|
| +5V DC  | 700 mA max | 1100 mA max |
| +12V DC | 60 mA max  | —           |
| -12V DC | 40 mA max  | —           |
- Operating Temperature: 0 to 50°C
- Storage Temperature: -20 to 70°C
- Relative Humidity:  
0 - 90%, non-condensing
- Dimensions: 3.5" x 11.8" x 1.0"
- External Connections: One 68-pin  
I/O connector

## Features

- Plug-in board for IBM PS/2  
Microchannel bus
- 8 asynchronous serial ports:  
mCOM8A - RS232C  
mCOM8B - RS422
- Data rate: 75 - 38,400 bps
- Software programmable data  
length, stop bits and parity
- Software programmable address  
mapping and interrupt level



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## mCOM8A/mCOM8B

### Functional Description

The CONTEC mCOM8 is a general purpose asynchronous communication board. The mCOM8A provides eight RS-232C ports while the mCOM8B provides eight RS-422 ports. Four Z85C30 ICs control the ports. The driver program, which is included with each board, allows the user to set up baud rates, interrupt signal level and adjust the data bit length.

One 68-pin common connector provides all signals for eight ports. An optional divider box, DIV232C, attached to the common connector provides eight independent D-type 25-pin connectors for RS232C ports. A second optional divider box, DIV422, attached to the common connector provides eight independent, 15-pin connectors for the RS422 ports.

### I/O Addresses & Interrupts

I/O addresses and interrupt request line are all handled by start-up software.

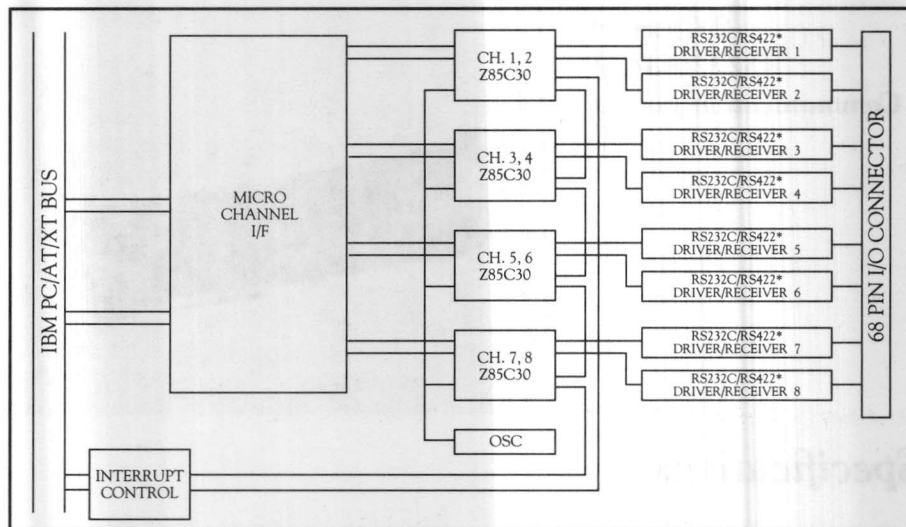
### I/O Ports and Registers

Each channel has a data register and a command register. There is an interrupt status register which depends on all 8 channels. The address map for the registers is shown below.

#### DEFAULT BASE ADDRESS

|                  |      |
|------------------|------|
| SCC BASE ADDRESS | 200H |
| INT BASE ADDRESS | 210H |

\*NOTE: The above mentioned default base addresses are selected by using the driver program and can also be changed by using the driver program.



\*mCOM8A – RS232C  
\*mCOM8B – RS422

#### I/O ADDRESS MAP

| I/O PORT ADDRESS      | REGISTER             | R/W |
|-----------------------|----------------------|-----|
| SCC BASE ADDRESS + 0H | CH2 COMMAND REGISTER | R/W |
| SCC BASE ADDRESS + 1H | CH2 DATA REGISTER    | R/W |
| SCC BASE ADDRESS + 2H | CH1 COMMAND REGISTER | R/W |
| SCC BASE ADDRESS + 3H | CH1 DATA REGISTER    | R/W |
| SCC BASE ADDRESS + 4H | CH4 COMMAND REGISTER | R/W |
| SCC BASE ADDRESS + 5H | CH4 DATA REGISTER    | R/W |
| SCC BASE ADDRESS + 6H | CH3 COMMAND REGISTER | R/W |
| SCC BASE ADDRESS + 7H | CH3 DATA REGISTER    | R/W |
| SCC BASE ADDRESS + 8H | CH6 COMMAND REGISTER | R/W |
| SCC BASE ADDRESS + 9H | CH6 DATA REGISTER    | R/W |
| SCC BASE ADDRESS + AH | CH5 COMMAND REGISTER | R/W |
| SCC BASE ADDRESS + BH | CH5 DATA REGISTER    | R/W |
| SCC BASE ADDRESS + AH | CH8 COMMAND REGISTER | R/W |
| SCC BASE ADDRESS + BH | CH8 DATA REGISTER    | R/W |
| SCC BASE ADDRESS + CH | CH7 COMMAND REGISTER | R/W |
| SCC BASE ADDRESS + DH | CH7 DATA REGISTER    | R/W |
| SCC BASE ADDRESS + EH | CH5 COMMAND REGISTER | R/W |
| SCC BASE ADDRESS + FH | CH5 DATA REGISTER    | R/W |
| INTBASE ADDRESS + 0H  | INTERRUPT STATUS     | R   |

\*NOTE: The channel numbers are not sequential corresponding to the addresses.

### Connectors

Shown below are the separate pin assignments for CN1, a 68-pin I/O connector.

| Pin # | Signals         |                 | Pin # | Signals         |                 |
|-------|-----------------|-----------------|-------|-----------------|-----------------|
|       | mCOM8A (RS232C) | mCOM8A (RS422C) |       | mCOM8A (RS232C) | mCOM8A (RS422C) |
| L1    | TXD1            | TXD+1           | R1    | TXD5            | TXD+4           |
| L2    | RXD1            | TXD-1           | R2    | RXD5            | TXD-4           |
| L3    | RTS1            | RXD+1           | R3    | RTS5            | RXD+4           |
| L4    | CTS1            | RXD-1           | R4    | CTS5            | RXD-4           |
| L5    | DTR1            | RTS+1           | R5    | NC              | RTS+4           |
| L6    | DCD1            | RTS-1           | R6    | NC              | RTS-4           |
| L7    | SG              | SG              | R7    | SG              | SG              |
| L8    | SG              | SG              | R8    | SG              | SG              |
| L9    | TXD2            | CTS+1           | R9    | TXD6            | CTS+4           |
| L10   | RXD2            | CTS-1           | R10   | RXD6            | CTS-4           |
| L11   | RTS2            | TXD+2           | R11   | RTS6            | TXD+5           |
| L12   | CTS2            | TXD-2           | R12   | CTS2            | TXD-5           |
| L13   | DTR2            | RXD+2           | R13   | NC              | RXD+5           |
| L14   | DCD2            | RXD-2           | R14   | NC              | RXD-2           |
| L15   | SG              | SG              | R15   | SG              | SG              |
| L16   | SG              | SG              | R16   | SG              | SG              |
| L17   | TXD3            | RTS+2           | R17   | TXD7            | TXD+6           |
| L18   | RXD3            | RTS-2           | R18   | RXD7            | TXD-6           |
| L19   | RTS3            | CTS+2           | R19   | RTS7            | RXD+6           |
| L20   | CTS3            | CTS-2           | R20   | CTS3            | RXD-6           |
| L21   | DTR3            | TXD+3           | R21   | NC              | TXD+7           |
| L22   | DCD3            | TXD-3           | R22   | NC              | TXD-7           |
| L23   | SG              | SG              | R23   | SG              | SG              |
| L24   | SG              | SG              | R24   | SG              | SG              |
| L25   | TXD4            | RXD+3           | R25   | TXD8            | RXD+7           |
| L26   | RXD4            | RXD-3           | R26   | RXD8            | RXD-7           |
| L27   | RTS4            | RTS+3           | R27   | RTS8            | TXD+8           |
| L28   | CTS4            | RTS-3           | R28   | CTS8            | TXD-8           |
| L29   | DTR4            | CTS+3           | R29   | +12V            | RXD+8           |
| L30   | DCD4            | CTS-3           | R30   | +12V            | RXD-8           |
| L31   | NC              | NC              | R31   | NC              | NC              |
| L32   | NC              | NC              | R32   | NC              | NC              |
| L33   | NC              | NC              | R33   | NC              | NC              |
| L34   | NC              | NC              | R34   | NC              | NC              |

## Programming

The assembly driver program shipped with the mCOM8 interface board provides a set of high level functions CALLable from Microsoft C. The driver controls all eight channels.

The driver program is a memory resident file which provides all operation modes. All functions are made with a single CALL statement:

### Function 0: PARAMETER SET

Set the parameters to the channel-initial-table

### Function 1: INTIAL

Initialize all channels by using the channel-initial-table. Load the interrupt routine

### Function 2: OPEN

Open a channel for RS232C/RS422 communication

### Function 3: CLOSE

Close (disable) an opened channel

### Function 4: SEND

Output data via the selected channel

### Function 5: SEND-BUFFER CHECK

Return the number of bytes which stays in the buffer waiting for transmission

### Function 6: RECEIVE

Input data from the selected channel

## Accessories

#### A. Included with Board

1. I/O connector (loose)
2. Users Manual
3. Floppy disk containing drivers

#### B. Optional – to be ordered extra

### 1380020 DIV232 Distribution Panel for mCOM8A

DIV232C, attached to the common connector provides eight independent, D-type 25-pin connectors for RS232C ports.

### 1380010 DIV422 Distribution Panel for mCOM8B

DIV422, attached to the common connector provides eight independent, 15-pin connectors for RS422 ports.

### 2180020 MT/68 Cable

A 4 foot, flat cable with 68-pin male I/O connectors at either end.

### 2180010 MT/S Cable

A 4 foot shielded cable with 68-pin male I/O connectors at either end.

## Connectors

The following diagram shows the pin assignment for CN1 to CN8 of DIV232.

### DIV232

| PIN # | CN1 – CN4 SIGNALS | CN5 – CN8 SIGNALS |
|-------|-------------------|-------------------|
| 1     | FG                | FG                |
| 2     | TXD               | TXD               |
| 3     | RXD               | RXD               |
| 4     | RTS               | RTS               |
| 5     | CTS               | CTS               |
| 6     | NC                | NC                |
| 7     | SG                | SG                |
| 8     | DCD               | NC                |
| 9–19  | NC                | NC                |
| 20    | DTR               | DTR*              |
| 21–25 | NC                | NC                |

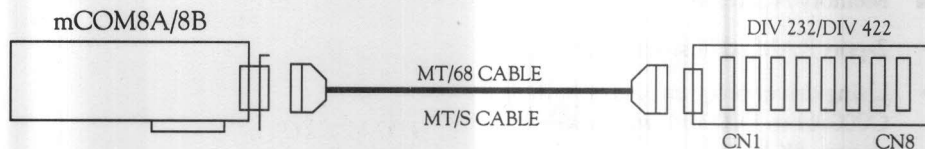
\*DTR of CN5 – CN8 is always active

The following diagram shows the pin assignment for CN1 to CN8 of DIV422.

### DIV422

| PIN # | CN1 – CN4 SIGNALS | CN5 – CN8 SIGNALS |
|-------|-------------------|-------------------|
| 1     | TXD+              | TXD+              |
| 2     | RXD+              | RXD+              |
| 3     | RTS+              | NC                |
| 4     | CTS+              | NC                |
| 5     | SG                | SG                |
| 6–8   | NC                | NC                |
| 9     | TXD–              | TXD–              |
| 10    | RXD–              | RXD–              |
| 11    | RTS–              | NC                |
| 12    | CTS–              | NC                |
| 13    | FG                | FG                |
| 14    | NC                | NC                |
| 15    | NC                | NC                |

## Product Configuration

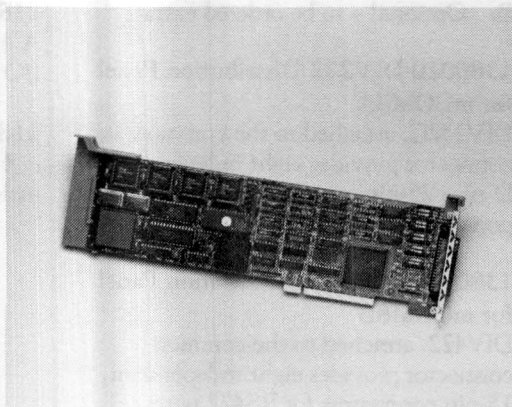


mCOM8A – DIV232 = 8 – 25-pin D-connectors  
mCOM8B – DIV422 = 8 – 15-pin D-connectors

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# mICOM8A/mICOM8B

8-Channel Intelligent  
RS232C/RS422  
Communication Boards



## Specifications

### ■ Communication

- Input Type: mICOM8A – RS232C  
mICOM8B – RS422
- Number of Channels: 8 channels
- Baud Rate: 75 – 38,400 bps
- Data Buffer: 1K bytes, 2-port RAM supported by firmware
- Data Word Length: 5, 6, 7, or 8 bits
- Stop Bits: 1, 1.5 or 2 bits
- Parity: Even, Odd or None
- CPU: i80188, 10 MHz + 64 K byte ROM + 64 byte RAM
- UART IC: Z85C30

### ■ Interrupt Signals:

- Any one level IRQ3 – IRQ7

### ■ Memory Addresses

- 2-port RAM address selection
- Using driver program, select from C0000H to D0000H, which will occupy 8K bytes

### ■ General

- Occupies one slot on IBM PS/2 Microchannel bus
- Power consumption:

|         | mICOM8A     | mICOM8B     |
|---------|-------------|-------------|
| +5V DC  | 1200 mA max | 1600 mA max |
| +12V DC | 60 mA max   | —           |
| –12V DC | 40 mA max   | —           |
- Operating Temperature: 0 to 50°C
- Storage Temperature: –20 to 70°C
- Relative Humidity: 0 to 90%, non-condensing
- Dimensions: 3.5" x 11.8" x 1.0"
- External Connections: One 68-pin common connector

## Features

- Plug-in board for IBM PS/2 Microchannel bus
- 8 asynchronous serial ports for RS232C (mICOM8A) or RS422 (mICOM8B)
- On-board CPU with 64K byte EPROM and 64K byte RAM
- 1K byte, 2-port RAM as interface buffer
- User download program area available
- Data rates 75 – 38,400 bps
- Interrupt handling capability
- Software programmable data characters; stop bits and parity; address mapping; interrupt level
- Includes driver program and on-chip firmware
- Programmable memory address mapping



## Functional Description

The CONTEC mICOM8 is a general purpose intelligent asynchronous communication board. The mICOM8A provides eight RS232C ports while the mICOM8B provides eight RS422 ports. Four Z85C30 ICs control the ports. The on-board i80188 CPU works with the firmware to transmit and receive data between the host and external equipment, so that the user may transfer/receive up to 256/640 data bytes in one transaction, thereby increasing the system's speed. Using the driver program, which is included with each board, the user may command communication settings as well as user program downloading.

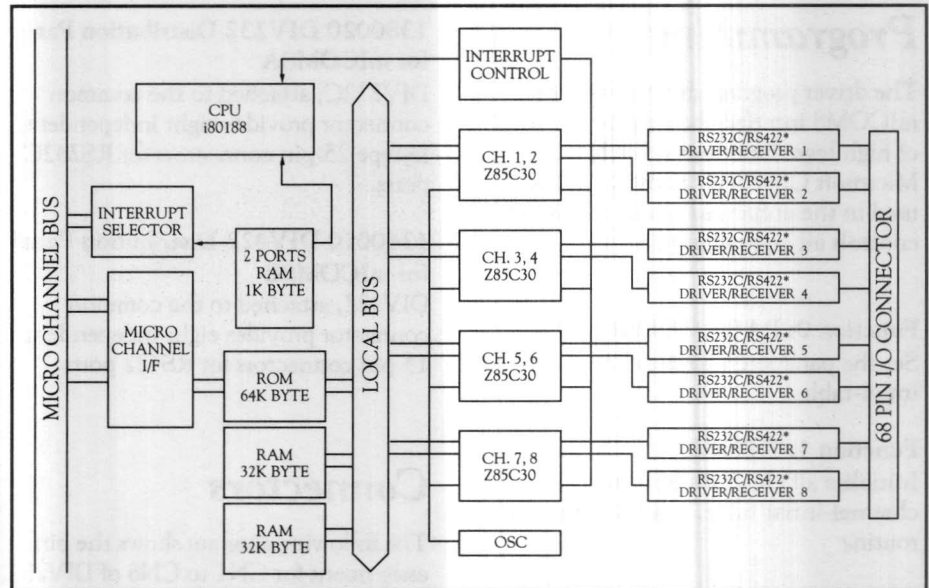
One 68-pin common connector provides all signals for 8 ports. An optional divider box, DIV232C, attached to the common connector provides eight independent, D-type, 25-pin connectors. A second optional divider box, DIV422, attached to the common connector, provides eight independent, 15-pin connectors.

## Memory Addresses & Interrupts

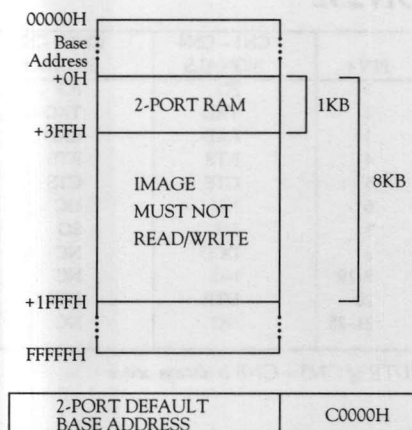
Memory addresses and interrupt request lines are all handled by start-up software.

## Interface Memory

1024 bytes can be used for read/write from both the host and the on-board CPU i80188 at any time.



\*mICOM8A - RS232C  
\*mICOM8B - RS422



## Connectors

Shown below are the separate pin assignments used on the CN1, a 68-pin I/O connector, for RS232C and RS422 communications.

| Pin # | Signals          |                  | Pin # | Signals          |                  |
|-------|------------------|------------------|-------|------------------|------------------|
|       | mICOM8A (RS232C) | mICOM8A (RS422C) |       | mICOM8A (RS232C) | mICOM8A (RS422C) |
| L1    | TXD1             | TXD+1            | R1    | TXD5             | TXD+4            |
| L2    | RXD1             | TXD-1            | R2    | RXD5             | TXD-4            |
| L3    | RTS1             | RXD+1            | R3    | RTS5             | RXD+4            |
| L4    | CTS1             | RXD-1            | R4    | CTS5             | RXD-4            |
| L5    | DTR1             | RTS+1            | R5    | NC               | RTS+4            |
| L6    | DCD1             | RTS-1            | R6    | NC               | RTS-4            |
| L7    | SG               | SG               | R7    | SG               | SG               |
| L8    | SG               | SG               | R8    | SG               | SG               |
| L9    | TXD2             | CTS+1            | R9    | TXD6             | CTS+4            |
| L10   | RXD2             | CTS-1            | R10   | RXD6             | CTS-4            |
| L11   | RTS2             | TXD+2            | R11   | RTS6             | TXD+5            |
| L12   | CTS2             | TXD-2            | R12   | CTS2             | TXD-5            |
| L13   | DTR2             | RXD+2            | R13   | NC               | RXD+5            |
| L14   | DCD2             | RXD-2            | R14   | NC               | RXD-2            |
| L15   | SG               | SG               | R15   | SG               | SG               |
| L16   | SG               | SG               | R16   | SG               | SG               |
| L17   | TXD3             | RTS+2            | R17   | TXD7             | TXD+6            |
| L18   | RXD3             | RTS-2            | R18   | RXD7             | TXD-6            |
| L19   | RTS3             | CTS+2            | R19   | RTS7             | RXD+6            |
| L20   | CTS3             | CTS-2            | R20   | CTS3             | RXD-6            |
| L21   | DTR3             | TXD+3            | R21   | NC               | TXD+7            |
| L22   | DCD3             | TXD-3            | R22   | NC               | TXD-7            |
| L23   | SG               | SG               | R23   | SG               | SG               |
| L24   | SG               | SG               | R24   | SG               | SG               |
| L25   | TXD4             | RXD+3            | R25   | TXD8             | RXD+7            |
| L26   | RXD4             | RXD-3            | R26   | RXD8             | RXD-7            |
| L27   | RTS4             | RTS+3            | R27   | RTS8             | TXD+8            |
| L28   | CTS4             | RTS-3            | R28   | CTS8             | TXD-8            |
| L29   | DTR4             | CTS+3            | R29   | +12V             | RXD+8            |
| L30   | DCD4             | CTS-3            | R30   | +12V             | RXD-8            |
| L31   | NC               | NC               | R31   | NC               | NC               |
| L32   | NC               | NC               | R32   | NC               | NC               |
| L33   | NC               | NC               | R33   | NC               | NC               |
| L34   | NC               | NC               | R34   | NC               | NC               |

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## mICOM8A/mICOM8B

### Programming

The driver program shipped with the mICOM8 interface board provides a set of high level functions callable from Microsoft C. When the mICOM8 is used in the enhanced mode, the driver controls all eight channels.

#### Function 0: PARAMETER SET

Set the parameters to the channel-initial-table

#### Function 1: INTIAL

Initialize all channels by using the channel-initial-table. Load the interrupt routine

#### Function 2: OPEN

Open a channel for RS232C/RS422 communication

#### Function 3: CLOSE

Close (disable) an opened channel

#### Function 4: SEND

Output data via the selected channel

#### Function 5: RECEIVE

Input data from all channels

### Accessories

#### A. Included with Board

1. I/O Connector (loose)
2. Users Manual
3. Floppy disk containing drivers

#### B. Optional - to be ordered extra

#### 1380020 DIV232 Distribution Panel for mICOM8A

DIV232C, attached to the common connector provides eight independent, D-type 25-pin connectors for RS232C ports.

#### 1380010 DIV422 Distribution Panel for mICOM8B

DIV422, attached to the common connector provides eight independent, 15-pin connectors for RS422 ports.

#### 2180020 MT/68 Cable

A 4 foot, flat cable with 68-pin male I/O connectors at either end.

#### 2180010 MT/S Cable

A 4 foot shielded cable with 68-pin male I/O connectors at either end.

### Connectors

The following diagram shows the pin assignment for CN1 to CN8 of DIV232.

#### DIV232

| PIN # | CN1 - CN4 SIGNALS | CN5 - CN8 SIGNALS |
|-------|-------------------|-------------------|
| 1     | FG                | FG                |
| 2     | TXD               | TXD               |
| 3     | RXD               | RXD               |
| 4     | RTS               | RTS               |
| 5     | CTS               | CTS               |
| 6     | NC                | NC                |
| 7     | SG                | SG                |
| 8     | DCD               | NC                |
| 9-19  | NC                | NC                |
| 20    | DTR               | DTR*              |
| 21-25 | NC                | NC                |

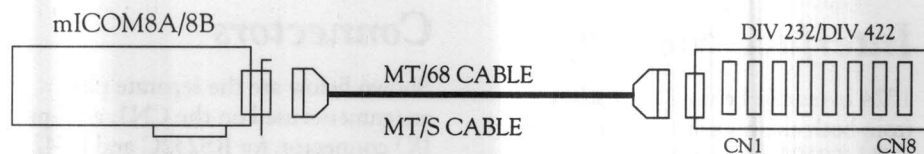
\*DTR of CN5 - CN8 is always active

The following diagram shows the pin assignment for CN1 to CN8 of DIV422.

#### DIV422

| PIN # | CN1 - CN4 SIGNALS | CN5 - CN8 SIGNALS |
|-------|-------------------|-------------------|
| 1     | TXD+              | TXD+              |
| 2     | RXD+              | RXD+              |
| 3     | RTS+              | NC                |
| 4     | CTS+              | NC                |
| 5     | SG                | SG                |
| 6-8   | NC                | NC                |
| 9     | TXD-              | TXD-              |
| 10    | RXD-              | RXD-              |
| 11    | RTS-              | NC                |
| 12    | CTS-              | NC                |
| 13    | FG                | FG                |
| 14    | NC                | NC                |
| 15    | NC                | NC                |

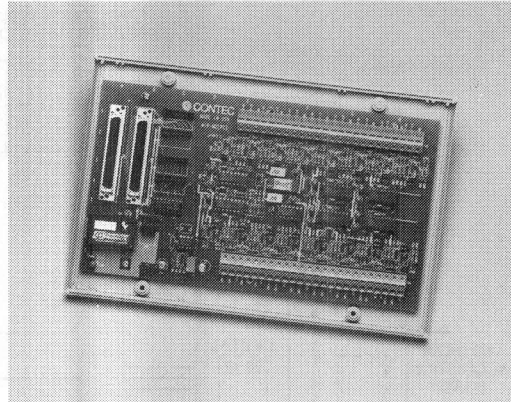
### Product Configuration



mICOM8A - DIV232 = 8 - 25-pin D-connectors  
mICOM8B - DIV422 = 8 - 15-pin D-connectors

# ATP-M ATP-M2

## Analog Input Multiplexer Boards



## Specifications

### Inputs

- Analog Inputs
  - Number of inputs: 16 differential analog inputs
  - Input range:  $\pm 10$  mV to  $\pm 10$  V, based on gain selection
  - Overvoltage protection:  $\pm 30$  V continuous
  - Common mode rejection ratio: 85 dB
  - Input gain: common for all channels
    - ATP-M: 0.5 to 1000 switch selectable or user defined
    - ATP-M2: 1 to 1000 switch or software selectable/channel.
  - Input filters: ATP-M: Low pass filter – 417 Hz, provision for each channel, can be modified or disconnected

- Temperature measurement with thermocouples
  - Type of thermocouples: J, K, R, S, T, E.
  - Cold junction compensation:  $+24.4$  mV $^{\circ}$ C, 0.00 mV at 0.0 $^{\circ}$ C
  - CJC voltage used as one output channel
  - Open thermocouple detection: Bias resistor/channel
- Current measurement
  - Provision for shunt resistors for each channel
- Outputs
  - Number of outputs: 2;
    - 1 multiplexed analog signal,
    - 1 CJC voltage when thermocouples are used
  - Multiplexed signal output range:  $\pm 10$  V, single-ended

## Features

- Operate with CONTEC Analog Input Interface boards
- 16 differential inputs multiplexed into one single-ended output
- Enable up to 128/256 channels to be connected to a single plug-in board for IBM PC/XT/AT or PS/2 machines
- Temperature measurement with thermocouples t, open-thermocouple detection provided
- Input gain switch selectable or user defined or via software (ATP-M2), up to a factor of 1000
- Circuitry for filters, attenuation, current shunt
- DC/DC converter enables the boards to be powered directly from the PC



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## ATP-M/ATP-M2

### Specifications (continued)

#### I/O Selection

- Input channel selection: Controlled by a 4-bit, TTL-level, digital output data sent by the data acquisition control board, e.g. ADC-30
- Output channel selection: via on board jumpers, one channel for multiplexed signal and one channel for CJC voltage (when used)

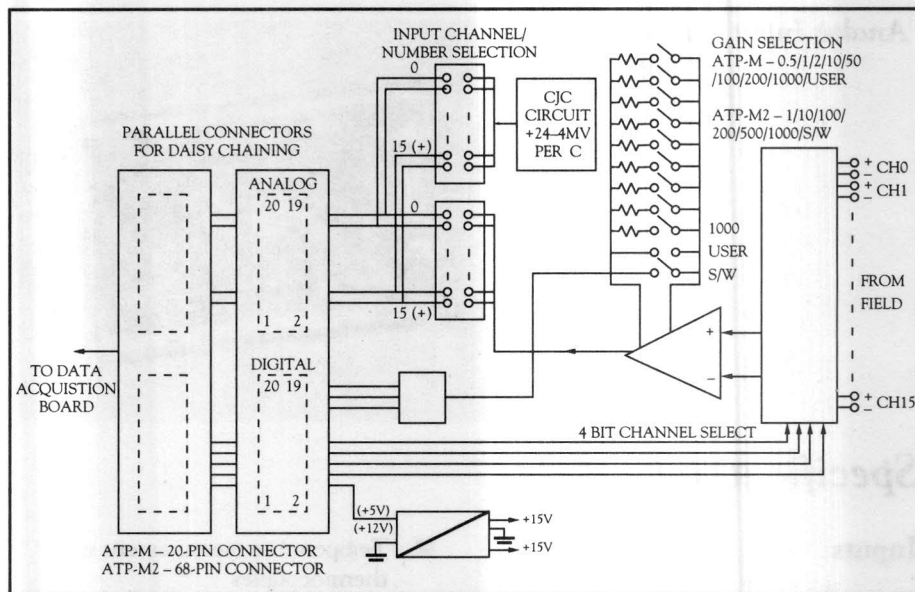
#### Cascading

Set of parallel connectors provided for cascading

- ATP-M up to 8 boards
- ATP-M2 up to 16 boards

#### General

- Table or panel mountable
- Power consumption: +5V, 10mA; +12V, 80mA drawn from data acquisition board
- DC/DC converter on board
- Operating Temperature: 0 to 50°C
- Storage Temperature: -20 to 70°C
- Relative Humidity: 0 to 90%, non-condensing
- Dimensions:  
ATP-M: 8.07" x 4.5" x 1.0"  
ATP-M2: 8.9" x 5.0" x 1.0"
- External connections:  
Field signals via: screw terminals on board  
To data acquisition board and other multiplexer boards:  
ATP-M: via four 20-pin flat cable connectors  
ATP-M2: via 68-pin I/O connector



### Functional Description

The ATP-M and ATP-M2 are versatile front-end signal conditioning and input multiplexing boards. They are used along with CONTEC plug-in analog input boards for IBM PC/XT/AT or PS/2 and compatible machines.

They can also be used with any data acquisition board which can handle analog inputs, provide four bits of TTL/CMOS digital control signals as well as +5V power supply.

The ATP-M multiplexes 16 differential input channels into one output channel. This output is fed as one analog input channel to an analog input board. The Multiplexer boards can be cascaded via a series of parallel connectors. (ATP-M up to 8 boards, ATP-M2 up to 16 boards.) This enables up to 128/256 differential inputs to be connected to a single analog input board.

Each board occupies a specific input channel on the analog input board. Channel number is set via jumpers on the Multiplexer board.

A variety of different types and ranges of input signals can be handled :

- Voltages:  $\pm 10$  mV to  $\pm 10$  V  
A high-grade instrumentation amplifier offers gain selection facility. In ATP-M, the gain factor is switch selectable or can be user defined using an appropriate resistor. In case of ATP-M2, the gain can be selected via the DIP switch common for all channels or via software individually for each channel.
- Currents:  
Plated-through holes are provided for each channel for shunt resistors to attain voltages in the range specified above.

- **Thermocouples:**  
Type J, K, R, S, T, E, can be connected directly for temperature measurement. A cold junction compensation circuit is provided. This CJC voltage is fed to the analog input board as an independent input channel. Open thermocouples can be detected by the biasing resistor circuit provided for each channel.
- **Input Filters**  
Provision is made for filters on each channel. These can be switched on/off via jumpers, or modified by changing the filter resistors and/or capacitors.

A set of parallel connectors enable daisy-chaining of the boards.

The boards are powered from the PC via the data acquisition board. They are provided with a DC/DC converter to obtain the  $\pm 15$  V supplies required for the circuits on-board.

## Accessories

### A. Included with the board

#### ATP-M

1. 2 flat ribbon cables with 20-pin header connectors at each end.
2. Connector adapter (with two 20-pin connectors at one end and a D-type 37-pin connector at the other end), for connecting to ADC-30 board.
3. Users Manual

#### ATP-M2

1. Users Manual

### B. Optional at extra cost

#### ATP-M2

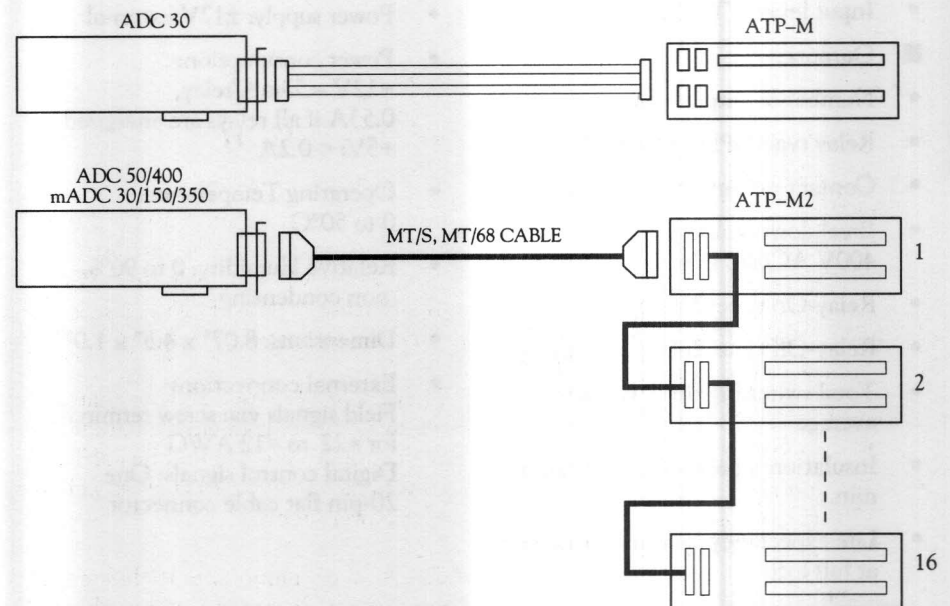
#### MT/68 Cable

A 4 foot flat ribbon cable with 68 pin male I/O connectors at either end.

#### MT/S Cable

a 4 foot shielded cable with 68 pin male I/O connectors at either end.

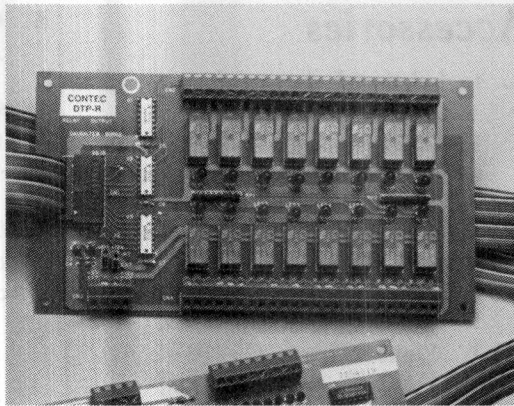
## Product Configuration



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# DTP-R

## Relay Output Board



## Features

- 16 channel relay output board
- Contacts SPDT, rating – 120V 1A
- Controlled through TTL/CMOS signals or digital output ports of any CONTEC analog or digital interface board
- Screw terminals for field output connections
- Individual LEDs to indicate activated relays

## Specifications

### ■ Control Inputs

- Number of inputs: 16
- Input level: TTL/CMOS

### ■ Outputs

- Number of outputs: 16
- Relay type: SPDT (Form C)
- Contact rating: 120V AC/DC, 1A
- Breakdown voltage: 400V AC/DC min.
- Relay-On time: 3msec average
- Relay-Off time: 2msec average
- Total switching time: 10 msec average
- Insulation resistance: 100 megohm min.
- Life expectancy: > 5 mn operations at full load

### ■ General

- Table or panel mountable
- Power supply:  $\pm 12V$  external
- Power consumption:  
+12V – 33mA/relay,  
0.53A if all relays are energized;  
+5V: < 0.2A
- Operating Temperature:  
0 to 50°C
- Relative Humidity: 0 to 90%,  
non condensing
- Dimensions: 8.07" x 4.5" x 1.0"
- External connections:  
Field signals via: screw terminals  
for #22 to #12 AWG  
Digital control signals: One  
20-pin flat cable connector



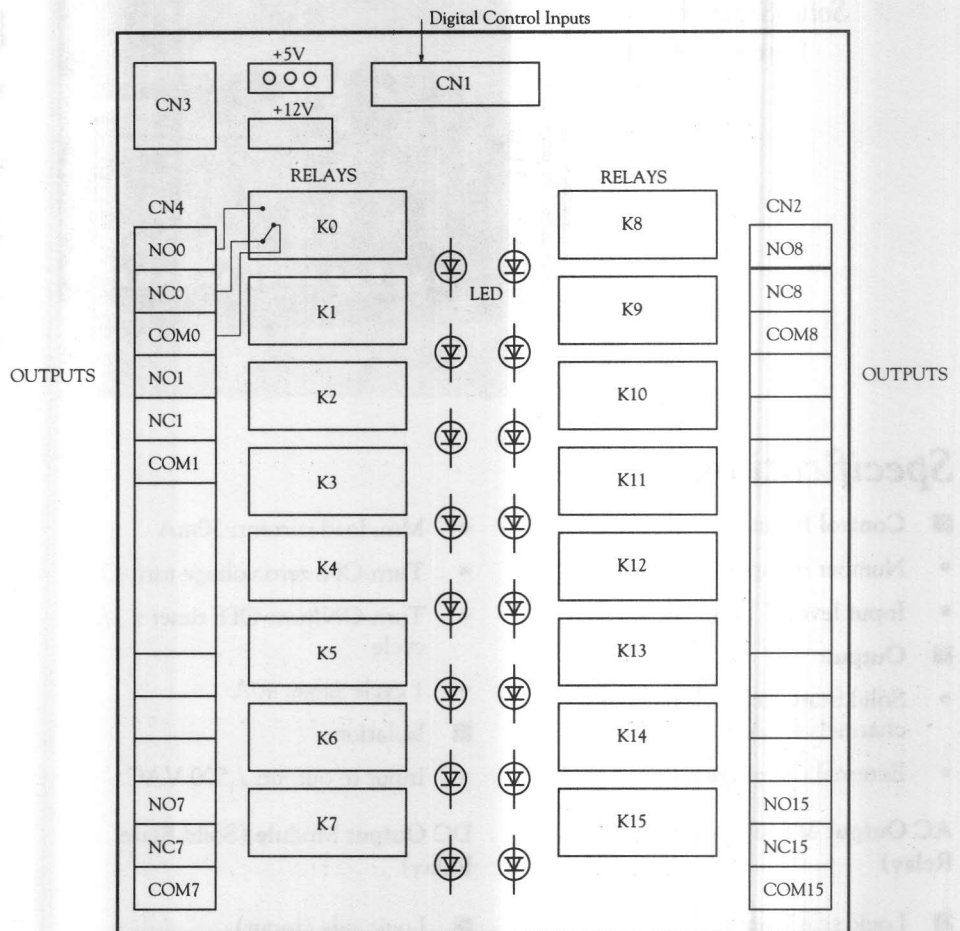
## Functional Description

The DTP-R is a termination panel providing 16 channels of output via potential-free contacts. These outputs can be used for general power switching, test configuration set-ups, for ON/OFF control, valve/solenoid control, alarm activation and the external outputs can be powered with +5V, +12V or an external power source up to +24V.

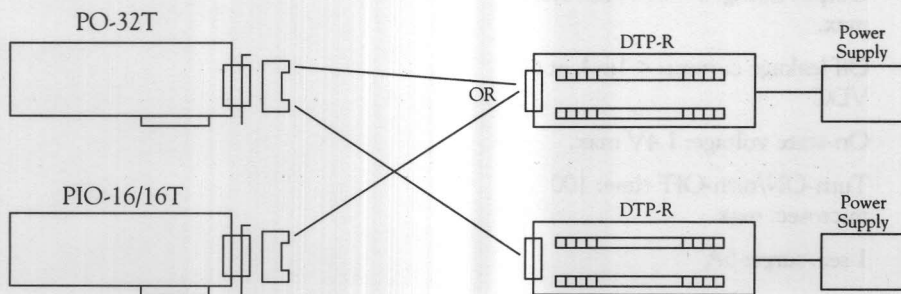
## Accessories

### A. Included with the board

1. 1 flat ribbon cable with 20-pin header connectors at each end, for connecting DTP-R to Connector adapter 2 below.
2. Connector adapter (with two 20-pin connectors at one end and a D-type 37-pin connector at the other end), for connecting to the D-type 37-pin connectors on the PIO-series interface boards.
3. Power supply adapter for connection to 110V, 60Hz mains.
4. Users Manual



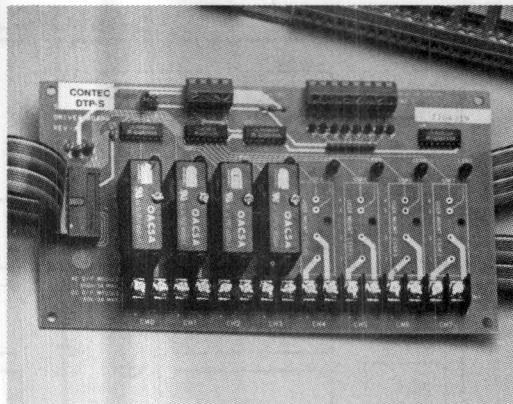
## Product Configuration



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# DTP-S

## Solid State Relay Output Board



## Specifications

### ■ Control Inputs

- Number of inputs: 16
- Input level: TTL/CMOS

### ■ Outputs

- Solid State Relay Outputs: 8 channels for AC/DC SSRs
- External driver outputs: 8

### AC Output Module (Solid State Relay)

#### ■ Logic side (Input)

- Input DC voltage: 3 – 8 VDC
- Input impedance: 220 Ohms
- Off input DC voltage: 1 VDC

#### ■ Field side (output)

- Switching voltage range: 12 – 280VAC
- Line frequency: 47 – 63 Hz
- Current rating: 3.0 A RMS
- Blocking voltage: 600Vpp max.
- OFF leakage current: 8mA max.
- On-state voltage: 1.6V max.

- Min. load current: 50mA
- Turn-ON: zero voltage turn-ON
- Turn-ON/turn-OFF time: < 1/2 cycle
- 1 cycle surge: 40A
- Isolation
- Input to output: 2,500 VAC

### DC Output Module (Solid State Relay)

#### ■ Logic side (Input)

- Input DC voltage: 3 – 8 VDC
- Input impedance: 220 Ohms
- OFF input DC voltage: 1 VDC

#### ■ Field side (output)

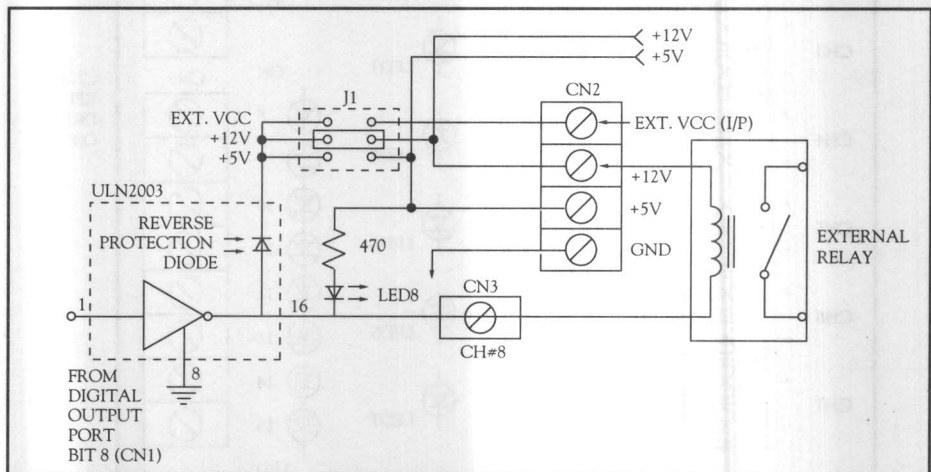
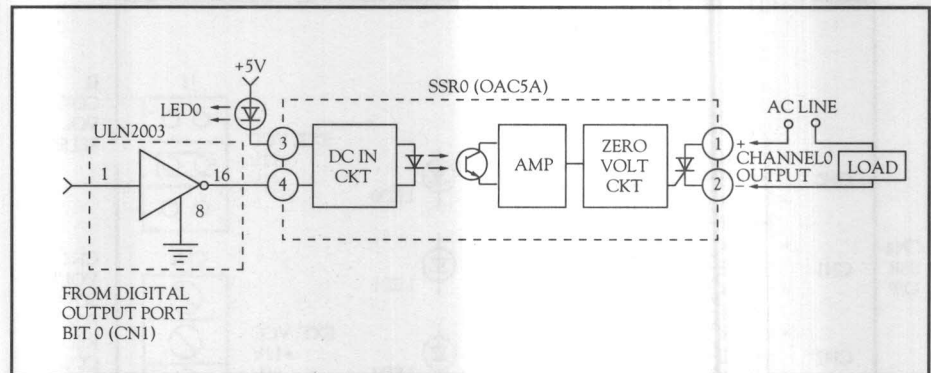
- Output rating: 5 – 60VAC, 3.0A max.
- Off leakage current: < 1mA at 60 VDC
- On-state voltage: 1.4V max.
- Turn-ON/turn-OFF time: 100 microsec. max.
- 1 sec. surge: 5A

## Features

- 16 channel output and termination board
- 8 output channels via solid state relays up to 280VAC/60VDC, 3A
- 8 channels with drivers for external outputs, such as electromechanical relays or lamps
- Controlled through TTL/CMOS signals or digital output ports or any CONTEC analog or digital interface board
- Screw terminals for field output connections
- Industry standard pin-out package for solid state relays
- Individual LEDs to indicate activated relays/circuits

## Specifications (Continued)

- Isolation
  - Input to output: 2,500 VAC
- External driver outputs
  - Number of channels: 8
  - Driver circuit: open-collector type
  - Max. drive current: 125mA/channel
  - Driver voltage: +5V or +12V from the board, or from external source up to 24 VDC, jumper selectable
- General
  - Table or panel mountable
  - Power supply: +12V external
  - Power consumption: +12V, 80mA; +5V, 10mA
  - Operating Temperature: 0 to 50°C
  - Storage Temperature: -20 to 70°C
  - Relative Humidity: 0 to 90%, non-condensing
  - Dimensions: 8.07" x 4.5" x 1.0"
  - External connections:
    - Field signals via: screw terminals for #22 to #12 AWG
    - Digital control signals: One 20-pin flat cable connector



## Functional Description

The DTP-S is a termination panel with driver circuits for 8 solid state relays and 8 external elements as outputs. These outputs can be used for general power switching, test configuration set-ups, for ON/OFF control, valve/solenoid control, alarm activation and annunciation.

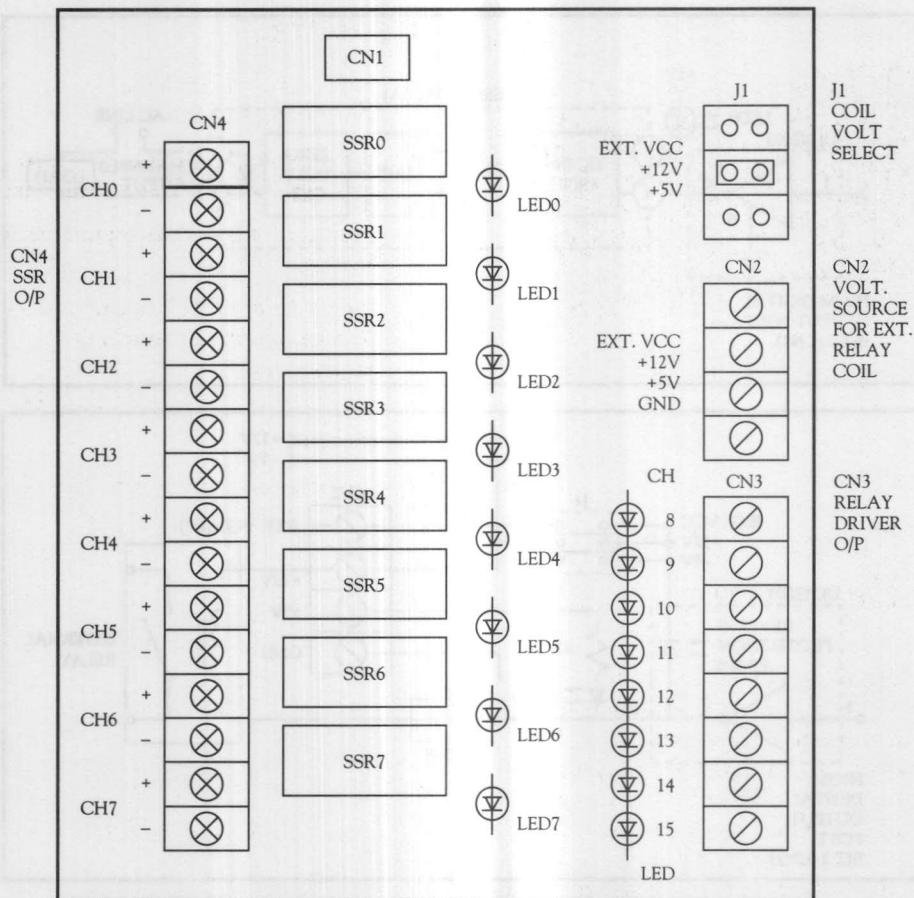
This board can be driven by the 16-bit digital output ports of any of CONTEC PIO-series boards such as the PO-32T, PIO-16/16T, PIO-96W, PIO-48W, PIO-48R, or PIO-48C.

These digital signals activate individual solid state relays or driver circuits for external outputs. Individual LEDs indicate an activated relay/circuit. The external outputs can be powered with +5V, +12V or an external power source up to +24V.



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## DTP-S



## Accessories

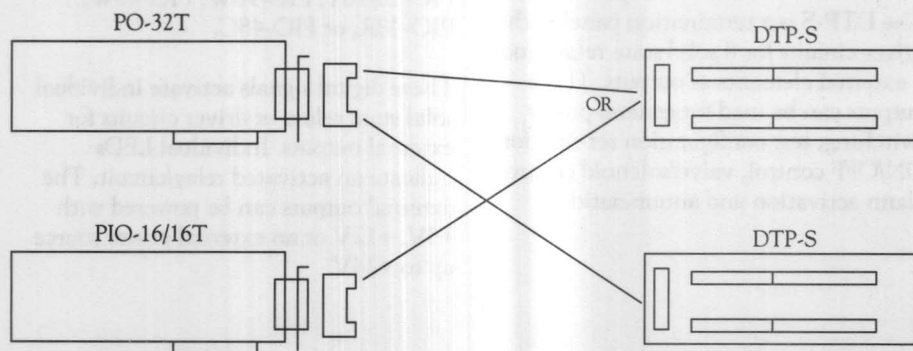
### A. Included with the board

- 1 flat ribbon cable with 20-pin header connectors at each end, for connecting DTP-S to Connector adapter (2 below).
- Connector adapter (with two 20-pin connectors at one end and a D-type 37-pin connector at the other end), for connecting to the D-type 37-pin connectors on the PIO-series interface boards.
- Power supply adapter for connection to 110V, 60Hz mains.
- Users Manual

### B. Optional to be ordered extra

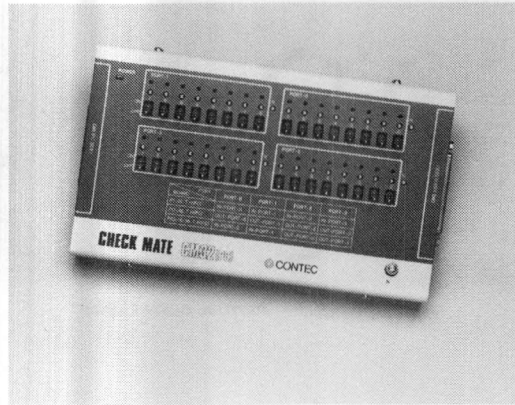
1. Solid State Relays – please specify AC or DC, Line voltage and current

## Product Configuration



# CM 32

## Check Mate Digital Signal Monitor



## Features

- Supports up to 32 digital input/output channels
- Provides monitor LED, check pin and toggle switch for each channel
- Monitors or generates input/output signals
- Aids software development and debugging without requiring external inputs
- Eases system diagnosis and trouble shooting
- Includes cable and ground line

## Specifications

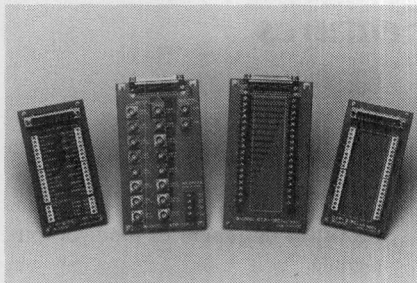
- Channels: 32
- Control Components on each channel: LED, Toggle Switch, Check Point
- Power Consumption: 200 mA MAX
- Dimensions: 9.5" x 6.5" x 2"
- Weight: 4.4 lbs
- External Power Supply: 12 – 60VDC (when used with opto-isolated I/O boards)
- Accessories Included: Digital I/O cable, Ground line
- Operating Temperature: 0 to 50°C
- Humidity: 0 to 90% (non-condensing)

## Functional Description

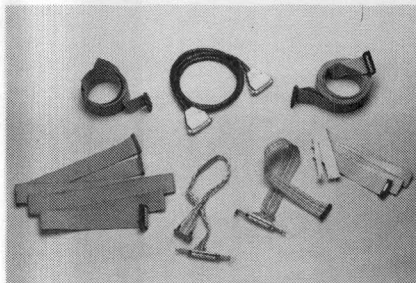
The CONTEC Check Mate CM-32 provides 32 connection points for monitoring or generating up to 32 digital signals simultaneously. Each point is connected to a check pin, an LED for visual monitoring and a toggle switch for manual control. The Check Mate CM-32 is ideal for system diagnosis and troubleshooting, and serves as a perfect tool for software development and debugging without the use of external devices. Using two 37-pin female D-type connectors, one end connects to an interface board in the IBM PC and the other to the data source. By connecting the input signals directly to the check pins for each channel, the Check Mate CM-32 can drive interface boards directly.

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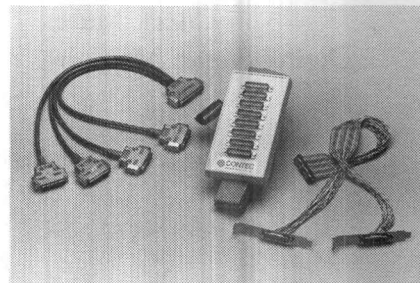
## Accessories



Termination Panels



Interconnection Cables



Accessories for Communication

### Analog Probe

The Analog Probe offers a convenient way to connect input or output channels on the ATP-1 terminal panel to your applications. The probe cable protects signals from noise in harsh operating environments. It is 4 feet long, with a BNC connector on one end and two large alligator clips on the other.

### ATP-1

The CONTEC ATP-1 is a BNC terminal panel designed for easy connection of your application to any CONTEC ADC Series board. The ATP-1 has 18 female BNC connectors (16 input lines and 2 output lines); four screw-type terminals for timer output and external trigger input; and a right-angle 37-pin female D-type connector. The ATP-1 offers the best signal protection when using the CONTEC Analog Probe. Connections between ADC Series boards and the ATP-1 can be made using the CONTEC DT shielded twisted-pair cable.

### ATP-2

The ATP-2 terminal panel features 40 screw-type terminals and a straight 37-pin female D-type connector for linking CONTEC ADC Series boards to external devices. The screw terminals accept 12 – 22 AWG wire for easy connection. The DT twisted-pair, shielded cable, can be used to connect CONTEC ADC boards to the ATP-2.

### DTP-1

The CONTEC DTP-1 is a digital I/O termination panel which provides 36 spring-type terminals and a right-angle, 37-pin female D-type connector. The spring terminals accept 12 – 22 AWG wire for easy connection. This terminal board is designed to be used with most digital inputs and outputs available on CONTEC interface boards. A set of terminal assignment labels is included to allow easy configuration for your application. Interface boards may be connected to the DTP-1 using DT

Cable. The DTP-1 may be used with the following CONTEC interface boards:

ADC-10, ADC-20, ADC-30, ADC-40, ADC-100/200/300, PI-32, PO-32, PIO-16/16, PIO-24/24, PIO-48W/R/C, PIO-96W, IRT-16, CNT16-4M, TCG-10, STP-2M

### DTP-2

The DTP-2 is a screw termination panel designed for connecting digital inputs and outputs from CONTEC interface boards to user application devices. It supports 36 screw-type terminals and a straight female D-type connector. The screw terminals accept 12 – 22 AWG wire for easy connection. Interface boards may be connected to the DTP-2 using DT Cable. The DTP-1 may be used with the following CONTEC interface boards:

ADC-10, ADC-20, ADC-30, ADC-40, ADC-100/200/300, PI-32, PO-32, PIO-16/16, PIO-24/24, PIO-48W/R/C, PIO-96W, IRT-16, CNT16-4M, TCG-10, STP-2M



## **DT-Cable**

The CONTEC DT Cable is a 4 foot, 20 twisted pair cable shielded cable with two 37-pin male D-type connectors. It connects to the following CONTEC interface boards:

ADC-10, ADC-20, ADC-30, ADC-40, ADC-100/200/300, PI-32, PO-32, PIO-16/16, PIO-24/24, PIO-48W/R/C, PIO-96W, CNT16-4M, TCG-10, IRT-16, STP-2M

## **DT Cable/B**

The CONTEC DT/B Cable is a 1.5 foot, 30 wire flat cable with one 30-pin header connector at one end and one 37-pin female D-type connector along with a mounting bracket for fixing to the PC slot at the other end. It is used to bring the digital signals from the following CONTEC interface boards to the PC back cover, from where a DT-cable can be used for external connections:

ADC-100/200/300, PIO-24/24, PIO-48W/R/C, PIO-96W

## **DT CABLE/O**

The CONTEC DT/O Cable is a 5 foot, 30 wire flat cable with one 30-pin header connector at one end and open wires at the other end. It is used to bring out the digital signals from the following CONTEC interface boards through the PC back cover, for connection to external terminal panels or devices:

ADC-100/200/300, PIO-24/24, PIO-48W/R/C, PIO-96W

## **MT/68-Cable**

The MT/68-Cable is a 4 foot flat ribbon cable with a 68-pin male I/O connector at each end. It connects to the following CONTEC interface boards: ADC-50, ADC-80, ADC-400, mADC30,

mADC150, mADC350, mPI-48, mPO-48, mPIO24/24, ICOM8A, ICOM8B, mCOM8A, mCOM8B, mICOM8A, mICOM8B.

## **MT/S-Cable**

The MT/S-Cable is a MT/68-cable provided with shielding.

## **MT/34-Cable**

The MT/34-Cable is similar to the MT/68-cable but with one 68-pin male I/O connector at one end and two 34-pin header connectors at the other end.

## **MT/O-Cable**

The MT/O-Cable is similar to the MT/68-cable but with a 68-pin male I/O connector at one end and open-ended at the other end.

## **DIV232**

The CONTEC DIV232 is a distribution box for use with CONTEC RS-232 communication interface boards, ICOM8A, mCOM8A, and mICOM8A. At one end it is connected to the interface boards, using a MT/68-Cable. At the other end, it provides eight 25-pin connectors to connect to 8 individual RS-232C ports. Housing for DIV232 is available as an option. Housing at extra cost.

## **DIV422**

The CONTEC DIV422 is a distribution panel for use with CONTEC RS-422 communication interface boards, ICOM8B, mCOM8B, and mICOM8B.

At one end it is connected to the interface boards, using a MT/68-Cable. At the other end, it provides eight 15-pin connectors to connect to 8 individual RS-422 ports. Housing for DIV422 is available as an option at extra cost.

## **RS-422 Cable**

The CONTEC RS-422 cable connects two RS-422 communication ports to CONTEC Serial communication interface board COM-4M. It has a 40-pin header connector at one end, to connect the COM-4M board and two 25-pin connectors at the other end to connect 2 individual RS-422 ports.

## **RS-232C Cable**

The CONTEC RS-232C cable connects four RS-232C communication ports to CONTEC Serial communication interface board COM-4M. It has a 37-pin D-type connector at one end, to connect the COM-4M board and four 25-pin connectors at the other end to connect 4 individual RS-232C ports.

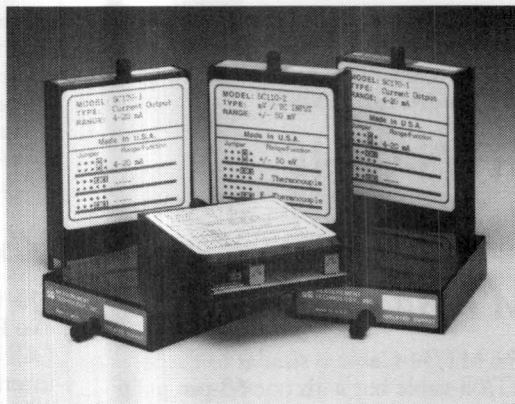
## **STP-I/O Cable**

The CONTEC STP-I/O Cable is specifically designed for the digital I/O of CONTEC Stepping Motor Controller board STP-2M. The cable is 5 feet long, with a 30-pin header connector at one end to connect the STP-2M, and a 37-pin D-type male connector at the other end to connect to a terminal panel.

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# SC 200 Series

## Isolated Signal Conditioners



## Description

### ISOLATED INPUT MODULES

The SC200 series modules feature 1500 Volt isolation, 240 Volt input protection and  $\pm 5V$  outputs. Bipolar voltage input signals produce bipolar outputs. Temperature inputs less than  $0^{\circ}C$  on RTDs and Thermocouples produce negative output voltages.

They can be easily integrated into custom data acquisition and control equipment. The modules use industry standard .025" gold plated pin/socket connectors and swaged PC board inserts for backplane attachment.

The modules feature an analog output switch and sample/hold amplifiers for maximum system flexibility.

### DC Voltage Input Modules—SC210

The SC210 - voltage input modules isolate and protect equipment and operators from wiring errors and fault conditions in the field. Up to 240V can be applied to the input terminals without damage to the module. They are available in three input ranges:  $\pm 1V$  (SC210-1);  $\pm 5V$  (SC210-2),  $\pm 10V$  (SC210-3)

### DC Millivolt/Thermocouple Input Modules—SC220

The SC220 modules isolate, filter, condition and amplify the millivolt

input signals. The modules contain a CJC circuit which can be enabled via a jumper, when working with thermocouples.

### Process Current Input Modules—SC240

The SC240 modules feature isolation, filtering and a field replaceable fuse in series with a built in 49.9 Ohm precision sense resistor minimizing the compliance voltage required.

### RTD Input Modules—SC230

The SC230 modules provide sensor excitation, filtering and accurate lead resistance compensation for 2, 3 and 4 lead RTDs. Linearization is provided for 0.00385 devices.

### ISOLATED WIDEBAND INPUT MODULES

The SC211 and SC221 are wideband versions of the SC210 and SC220 modules respectively, with faster response times for product test applications. Output time is 500 times faster than the standard modules and settles to 0.1% in just 3 milliseconds. These modules provide isolation but do not offer normal mode noise filtering.

## Features

- Complete Signal Conditioning Functions
  - 1500 V Transformer Isolation
  - Amplification, Filtering, CJC Compensation
  - High accuracy
  - Low Drift Front End
- Rugged Industrial Design
  - Hard Potted in High Temperature Plastic Cases
  - SAFE Non-conductive Attachment Screw
  - $-25$  to  $+85^{\circ}C$  Temperature Range
  - 240 V Input Fault Protection
- Easy to Use Solutions
  - Isolation Modules For Inputs and Outputs
  - Mix and Match Modules as required
  - Direct Cable connection to A/D Boards

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| INPUT MODULES                             | SC210/220            | SC240           | SC230            | SC220 <sup>1</sup> | SC211/221 <sup>2</sup> |
|-------------------------------------------|----------------------|-----------------|------------------|--------------------|------------------------|
| Input Range                               | DC Volt/mV           | 0-20, 4-20 mA   | RTD              | Thermocouple       | Wideband DC Volt/mV    |
| Output Range                              | ±5V                  | 0 to 5, 1 to 5V | ±5V              | ±5V                | ±5                     |
| Accuracy                                  | ±0.05% Span          | *               | *                | *                  | *                      |
| Nonlinearity                              | ±0.02% Span          | *               | 0.05% Conformity | *                  | *                      |
| Stability vs. Temperature                 |                      |                 |                  |                    |                        |
| Input Offset                              | ±1μV/°C              | ±0.002% Span/°C | ±0.02°C/C°       | ±0.02°C/C°         | ±1μV/°C                |
| Output Offset                             | ±40μV/°C             | *               | *                | *                  | *                      |
| Span Error (of RDG/°C)                    | ±25ppm               | ±35ppm          | ±50ppm           | ±25ppm             | ±25ppm                 |
| Common Mode Voltage (Continuous)          | 1500 V rms           | *               | *                | *                  | *                      |
| Common Mode Rejection @ 50/60Hz           |                      |                 |                  |                    |                        |
| 1KΩ Source Unbalance                      | 160dB                | *               | *                | *                  | 100dB/90dB             |
| Normal Mode Rejection @50/60 Hz           | 60dB                 | *               | *                | *                  | N/A                    |
| Input Protection Continuous               | 240V rms             | *               | *                | *                  | *                      |
| Output Resistance                         | 50Ω                  | *               | *                | *                  | *                      |
| Short Circuit Protection                  | Continuous to Ground | *               | *                | *                  | *                      |
| Input Transient Protection                | IEEE-STD 472 (SWC)   | *               | *                | *                  | *                      |
| Input Resistance                          | 10MΩ <sup>3</sup>    | 60Ω             | 10MΩ             | 10MΩ               | 10MΩ <sup>3</sup>      |
| Bandwidth                                 | 4Hz                  | •               | •                | *                  | 1 KHz                  |
| Output Selection Time                     | 20μs                 | *               | *                | *                  | *                      |
| Power Supply                              | +5V +5%              | *               | *                | *                  | *                      |
| Power Consumption                         | 0.15W                | *               | *                | *                  | *                      |
| Size                                      | 2.55" x 3.1" x .70"  | *               | *                | *                  | *                      |
| Environmental Specifications <sup>4</sup> |                      |                 |                  |                    |                        |
| Operating Temperature Range               | -25°C to +85°C       | *               | *                | *                  | *                      |
| Storage Temperature Range                 | -40°C to +85°C       | *               | *                | *                  | *                      |
| Relative Humidity (Non Condensing)        | 0 to 95% @ 60°C      | *               | *                | *                  | *                      |

\* Same specification as SC210 module  
<sup>1</sup>Thermocouples use mV input modules with cold junction compensation enabled with a jumper  
<sup>2</sup>Wideband modules available Q2 1989  
<sup>3</sup>Input resistance is >500KΩ for voltage inputs greater than ±5 Volts  
<sup>4</sup>Environmental specifications are the same for input and output modules

## Isolated Output Modules

### CURRENT OUTPUT MODULES-SC280

The SC280 module provides an active 0-20mA or 4-20mA current output signal. The output is electrically isolated up to 1500 V from other channels, the power supply and from ground. The module can drive loads up to 650 Ohms.

### VOLTAGE OUTPUT MODULES-SC290

The SC290 module offers an isolated ± 10 V output signal and features a third wire sense line to compensate for voltage drop in the output leads. The output voltage can be used for control or for precision strain gage sensor excitation.

| OUTPUT MODULES             | SC280              | SC290 <sup>1</sup> |
|----------------------------|--------------------|--------------------|
| Input Range                | 1 to 5 and 0 to 5V | ±V                 |
| Output Range               | 4-20 and 0-20mA    | ±10V               |
| Load Resistance Range      | 0 to 650Ω          | >350Ω              |
| Accuracy                   | ±0.05% Span        | *                  |
| Nonlinearity               | ±0.02% Span        | *                  |
| Stability over Temperature |                    |                    |
| Zero                       | 20ppm of Span/°C   | *                  |
| Span                       | 30ppm of Span/°C   | *                  |
| Common-Mode Voltage        | 1500V ms           | *                  |
| Output Protection          | IEEE-STD 472(SWC)  | *                  |
| Sample & Hold:             |                    |                    |
| Refresh Interval           | 25ms (0.01% Droop) | *                  |
| Acquisition Time           | 50μs               | *                  |
| Over Range Capability      | 10%                | *                  |
| Maximum Output             | 30 mA              | ±15V               |
| Input Resistance           | 10MΩ               | *                  |
| Bandwidth                  | 400Hz              | *                  |
| Power Supply               | +5V dc ±5%         | *                  |
| Power Consumption          | 0.85W              | *                  |
| Maximum Input Voltage      | -10V               | *                  |

<sup>1</sup>Voltage output modules available Q2 1989



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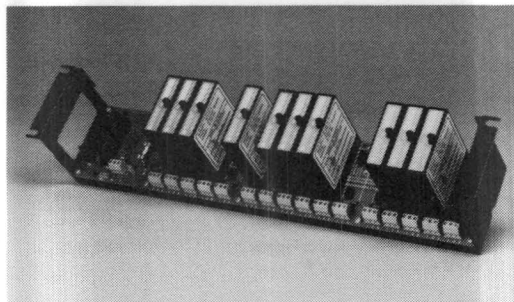
## SC 200 Series

### Insolated Output Modules (Continued)

#### BACKPLANES

A family of 16, 8 and single channel backplanes, SC-16, SC-08, SC-01 respectively, provide a complete signal conditioning solution. SC200 modules plug into these backplanes which provide screw terminals for all field wiring and power supply connections. The backplanes can be mounted in standard 19" relay racks or surface mounted in sealed industrial enclosures.

A multiplexed 16 channel backplane, SC-M, is available. It uses digital logic to select an analog signal to be returned on a common analog bus. The backplane also allows a single DAC output to drive many analog outputs using a sample and hold amplifier built into each output module.



### Product Guide

| PROD. NO.                          | MODEL   | INPUT                                                                                                 | OUTPUT  | RESPONSE     |
|------------------------------------|---------|-------------------------------------------------------------------------------------------------------|---------|--------------|
| ISOLATED INPUT MODULES             |         |                                                                                                       |         |              |
| SC210 High Level Voltage Input     |         |                                                                                                       |         |              |
| 108 1011                           | SC210-1 | ±1V                                                                                                   | ± 5V    | 60dB @ 60 HZ |
| 108 1012                           | SC210-2 | ± 5V                                                                                                  | ± 5V    | 60dB @ 60 HZ |
| 108 1013                           | SC210-3 | ± 10V                                                                                                 | ± 5V    | 60dB @ 60 HZ |
| SC220 Millivolt/Thermocouple Input |         |                                                                                                       |         |              |
| 108 1031                           | SC220-1 | ± 25mV                                                                                                | ±5V     | 60dB @ 60 HZ |
| TC Input                           |         | T-type (−250 to +400°C)<br>R-type (0 to + 1760°C)<br>S-type (0 to + 1760°C)<br>B-type (0 to + 1800°C) |         |              |
| 108 1032                           | SC220-2 | ± 50mV                                                                                                | ± 5V    | 60dB @ 60 HZ |
| TC Input                           |         | J-type (−150 to +760°C)<br>K-type (−150 to +1230°C)                                                   |         |              |
| 108 1033                           | SC220-3 | ±100mV ± 5V                                                                                           |         | 60dB @ 60 HZ |
| TC Input                           |         | E-type (−100 to +1000°C)                                                                              |         |              |
| *SC230 RTD-Input (.00385)          |         |                                                                                                       |         |              |
| 108 1051                           | SC230-1 | ± 200°C                                                                                               | ±5V     | 60dB @ 60 HZ |
| * SC240 Process Current Inputs     |         |                                                                                                       |         |              |
| 108 1061                           | SC240-1 | 0 to 20mA                                                                                             | 0 to 5V | 60dB @ 60 HZ |
|                                    |         | 4 to 20mA                                                                                             | 0 to 5V | 60dB @ 60 HZ |

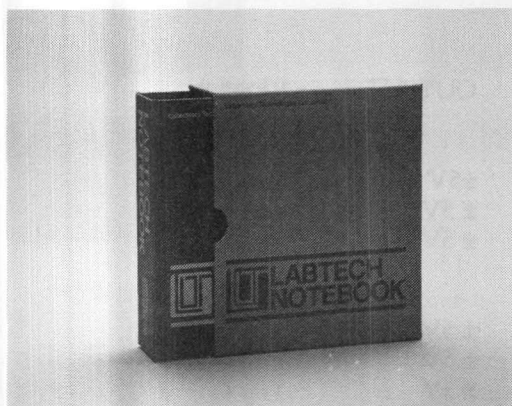
## Product Guide (Continued)

| PROD. NO.                               | MODEL   | INPUT    | OUTPUT | RESPONSE    |
|-----------------------------------------|---------|----------|--------|-------------|
| <b>ISOLATED WIDEBAND MODULES</b>        |         |          |        |             |
| <b>* SC211 Wideband Voltage Input</b>   |         |          |        |             |
| 108 1021                                | SC211-1 | ±1V      | ±5V    | 3 ms to .1% |
| 108 1022                                | SC211-2 | ±5V      | ± 5V   | 3 ms to .1% |
| 108 1023                                | SC211-3 | ± 10V    | ± 5V   | 3 ms to .1% |
| <b>* SC211 Wideband Millivolt Input</b> |         |          |        |             |
| 108 1041                                | SC221-1 | ± 25mV   | ± 5V   | 3 ms to .1% |
| 108 1042                                | SC221-2 | ± 50mV   | ± 5V   | 3 ms to .1% |
| 108 1043                                | SC221-3 | ± 100mV  | ± 5V   | 3 ms to .1% |
| <b>ISOLATED OUTPUT MODULES</b>          |         |          |        |             |
| <b>* SC280 Process Current Output</b>   |         |          |        |             |
| 108 1071                                | SC280-1 | 0 to +5V | 0-20mA | 400 HZ      |
|                                         |         | 1 to +5V | 4-20mA | 400 HZ      |
| <b>* SC290 Voltage Output</b>           |         |          |        |             |
| 108 1081                                | SC290-1 | ± 5V     | ± 10V  | 400 HZ      |

| PROD. NO.          | MODEL   | DESCRIPTION                                                                                            |
|--------------------|---------|--------------------------------------------------------------------------------------------------------|
| <b>BACKPLANES</b>  |         |                                                                                                        |
| 108 1091           | SC-16   | 16 Channel Voltage I/O                                                                                 |
| 108 1092           | SC-16M  | 16 Channel Multiplexed                                                                                 |
| 108 1093           | SC-08   | 8 Channel Voltage I/O                                                                                  |
| 108 1094           | SC-01   | Single channel                                                                                         |
| <b>ACCESSORIES</b> |         |                                                                                                        |
| 108 1101           | SC-RK   | 19" Rack Mounting Kit for 8 and 16 channel backplanes                                                  |
| 108 1102           | SC-PCP  | 5' power cable for IBM PC                                                                              |
| 108 1103           | SC-PS1  | +5V 1.5A, 120V AC supply                                                                               |
| 108 1104           | SC-CB1  | 3' Ribbon Cable (26 pin S x S)                                                                         |
| 108 1104           | SC-ADS  | Screw terminal adapter                                                                                 |
| 108 1106           | SC-USER | SC200 Users Manual                                                                                     |
| 108 1107           | SC-FS1  | Spare Parts Kit consisting of:<br>2-5V, 5A<br>2-1/16A current loop fuse<br>5-replacement module screws |

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# Labtech Notebook



## Specifications

|                         | Data Acquisition                                                                                                                                                                   | Process Control                 |
|-------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|
| ■ Sampling Rate         | Notebook: Up to 12.5 kHz;<br>Acquire: up to 50 Hz                                                                                                                                  | Up to 250 Hz<br>(Notebook only) |
| ■ Run Duration          | Up to 270 hr                                                                                                                                                                       | —                               |
| ■ Control Modes         | —                                                                                                                                                                                  | Open Loop, PID                  |
| ■ Output Types          | —                                                                                                                                                                                  | Digital, Analog                 |
| ■ Start Types           | Triggered, Delayed                                                                                                                                                                 | —                               |
| ■ Input Types           | Labtech Notebook: Digital, Analog, Pulse, Frequency;<br>Labtech Acquire: Digital, Analog Interface Boards: ADC<br>10/20/30/40, ADC 100/200/300, PI32T/H/L, PO32T/H/L,<br>PIO 16/16 |                                 |
| ■ Hardware Requirements | IBM PC, XT, AT, Compatible, 384K RAM; two floppy<br>drives or hard disks. Graphics board required for graphic<br>data display                                                      |                                 |
| ■ DOS version           | DOS 2.0 or greater                                                                                                                                                                 |                                 |
| ■ Software Interfaces   | Lotus 1-2-3, Labtech Real Time Access, other data<br>formats                                                                                                                       |                                 |

## Features

- Advanced software for data acquisition & process control
- Real-time data acquisition, including high speed operation
- Menu-driven for ease of use – no programming required
- Advanced curve fitting and FFT algorithms
- Built-in interfaces to existing analysis & spreadsheet programs
- Runs under PC/MS-DOS in foreground or background
- Operates on PC, XT, AT & Compatibles
- Programming option supports customized data acquisition and control
- Compatible with CONTEC PC products
- Labtech Real Time Access provides optional direct data interface to foreground application in real time
- Labtech Acquire provides an easy to use subset of Labtech Notebook functionality at a small fraction of the price



## **Functional Description**

Labtech Notebook is an advanced application for complete software data acquisition, control, and analysis. It replaces laboratory notebooks and manual processing of experimental data in the same way that Lotus 1-2-3 and other spreadsheet programs replaced paper calculations.

It works with CONTEC PC-based products to provide users with an integrated hardware and software solution.

Many Labtech Notebook functions operate in real time, including data acquisition, data analysis and reduction, data display and plotting, and process control.

In addition, Labtech Real Time Access operating with Labtech Notebook can send data directly to an application operating in the foreground of your PC, including Lotus 1-2-3. This allows true real-time data analysis and display.

## **Operation**

### **Data Acquisition**

Labtech Notebook makes data acquisition easy. The program operates in either Normal Mode, at from 0.001 Hz to 900 Hz sampling speeds, or in High-Speed Mode, at sampling speeds determined only by the CONTEC input boards being used.

In normal mode, each channel may be configured with different setup conditions, including scaling factors, channel types, sampling rates, starting method, etc.

In high-speed mode, Labtech Notebook stores data directly in the host computer's RAM during acquisition. This allows all the resources of the host to be used to capture data as quickly as possible. Data storage is limited only by the amount of RAM available.

### **Process Control**

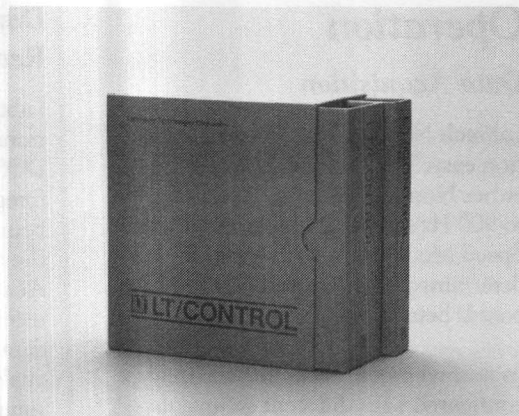
Labtech Notebook provides many features for use in open-loop and closed-loop process control applications. Using open-loop control, Labtech Notebook sequentially sends the contents of a data file to the CONTEC interface card. Using closed loop control, Labtech Notebook generates output according to a proportional integral derivative (PID) equation. This equation may be a function of the input from an A/D channel and four PID Loop variables: Gain, Reset, Rate, and Set Point.

### **Data Analysis Using Labtech Real Time Access**

Labtech Real-Time Access is an optional package which enables another DOS application running in the foreground to receive and analyze data being captured by Labtech Notebook in the background. Without Real Time Access, the foreground application may receive the data, but must wait until data capture has finished to begin analysis. Real Time Access allows simultaneous capture and analysis by a variety of software packages, including user-supplied software, spreadsheets like Lotus 1-2-3, databases, and others.

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# Labtech Control



## Specifications

- I/O Devices: Up to 16
- Scan rates:
  - Min: once per 3 years
  - Max: 2000 samples per second (normal mode); I/O hardware speed (high speed mode)
- Triggering: Immediate, variable value, delayed, pretriggering
- Data Logging: Continuous, including pretriggering
- Alarm Processing: None or annunciation & disk logging; optional operator acknowledgement

- Performance:
  - 320 PID loops/sec (16 MHz 80386 IBM-PC compatible)
  - 235 PID loops/sec (12 MHz 80286/287 IBM-PC compatible)
- Display Types: Trendline, time-Y, X-Y, bars, digital meters, PID faceplates
- Interface Boards: ADC 100/200/300, ADC 10/20/30/40, PIO16/16, PI32T/H/L, PO32T/H/L
- Hardware Requirements:
  - IBM PC/XT/AT or Compatibles; 640K RAM; hard disk; IBM EGA, VGA or equivalent; mouse.
  - DOS Version 3.0 or later

## Features

- Advanced, easy-to-use industrial monitoring and control software
- Real-time acquisition, control, display & analysis of industrial and research process control data
- Compatible with CONTEC PC products
- Run-time module available for multiple unit installations
- Multiple alarm states can be displayed and recorded
- Comprehensive control functions
- Real-time displays include trendline, multi-variable, bar graphs, digital meters, and controller faceplates
- Three levels of password security
- Operates as background task
- Designed for industrial users, from the makers of Labtech Notebook
- Built-in process graphics drawing system

## **Functional Description**

Labtech Control is an integrated, easy-to-use, industrial monitoring and control software system. It is designed to get processes up and running quickly by using a menu-driven operator interface and user-buildable graphics. It provides comprehensive industrial automation functions including process monitoring, data logging, process control, real-time interface, on-line analysis, and real-time display.

Labtech Control interfaces with a wide variety of process variables, such as analog voltage and current, discrete I/O, thermocouples, counter and frequency inputs, RS-232 devices. Using Labtech Control, process data can be monitored on a continual basis.

Labtech Control samples data for over 500 variables from as slow a rate as 1 per 3 years up to the fastest rate the hardware can handle. Values, tag names and alarm conditions are time stamped onto all data as it is collected.

Labtech Control's alarm functions can be triggered when a variable reaches or passes a predetermined value, or as a result of a calculated variable or

operator action.

Labtech Control provides a comprehensive series of control functions including PID, alarm, bang-bang control and automatic control; plus manual and automatic modes for on-line tuning. Set points may be constants, variables, or part of a pre-set file stored on disk. Labtech Control also provides cascade control capability, to allow the output of one control loop to act as the input to another. Users may tune control loops on-line, switching each loop from automatic to manual and back for systematic adjustment of control parameters.

Labtech Control uses an on-line graphic interface for configuration and operation. Users may paint their own process diagram using the pixel drawing package included, then animate their control strategy in real-time.

Labtech Control allows users to view process data in a variety of formats including digital values, strip charts or bar charts, trendlines, X-Y graphs, and control faceplates. The on-line trending capabilities allow display of up to 50 variables on a single screen, including multiple trendlines on the same screen.

Labtech Control also provides a large number of built-in analysis functions, including mathematical, trigonometric and statistical operations; binary and unitary operations; comparisons; logical operations; and data transformations.

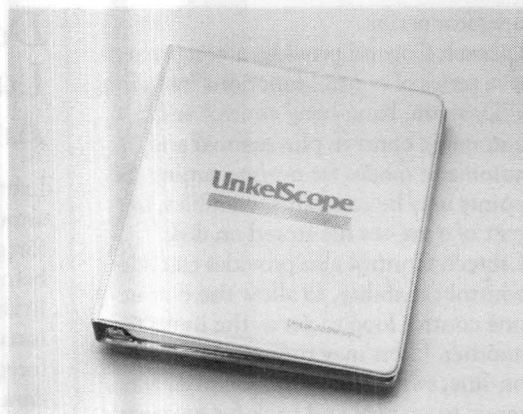
## **Data Analysis Using Labtech Real Time Access**

Labtech Real Time Access enables another DOS application running in the foreground to receive and analyze data being captured by CONTROL Labtech in the background. Without this feature, included with CONTROL Labtech, the foreground application may receive the data, but must wait until data capture has finished to begin analysis. Real Time Access allows simultaneous capture and analysis by a variety of software packages, including user-supplied applications, spreadsheets and database managers.



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# UnkelScope



## Specifications

- Maximum Sampling Channels: 8
- Maximum Viewing Channels: 2
- Minimum Sampling Rate: 0.002 Hz
- Maximum Sampling Rate: Hardware constrained only
- Maximum Samples/Channel
  - Junior: 1024/4; 4096/2;  
8192/1
  - Level 2+, 256K: 1024/8; 4096/2;  
8192/1
  - Level 2+, 512K: 4096/8; 8192/2;  
16384/1
- Hardware Requirements:  
IBM PC/XT/AT; 256K RAM  
2 floppy drives or floppy + hard disk  
CGA or Hercules graphics card

## Features

- Cost effective data acquisition & display software package
- Supports CONTEC data acquisition boards
- Completely menu driven interface for easy use
- Real-time plots of signal vs. signal
- Intuitive graphical data editing capability for fast data analysis
- FFTs, digital filters, differentiation & integration
- Real-time linear conversion
- Flexible trigger options include keyboard input, analog signal or digital input
- Optional direct-to-disk data acquisition
- Optional process control capability (UnkelScope Level 2)
- Operates on IBM PC/XT/AT & compatibles
- Available in three models which feature increasing capacity for larger projects, Junior, Level 1 and Level 2+

## Functional Description

UnkelScope is a full-featured data acquisition and display application at a very low price. The complete menu-driven interface makes both learning and use easy. UnkelScope also provides features such as real-time plots of one signal versus another; graphical editing, and optional direct-to-disk data logging.

## Operation

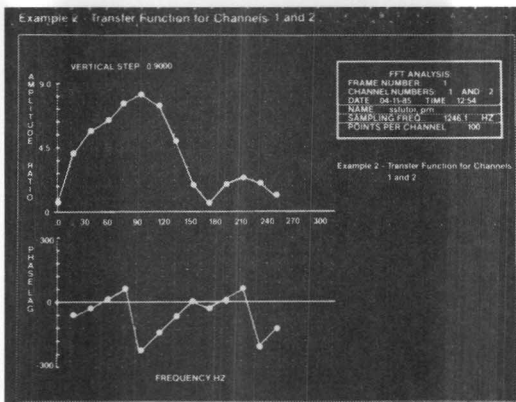
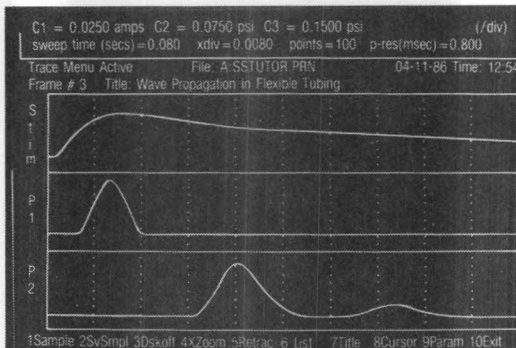
Users may configure UnkelScope to suit their application requirements.

UnkelScope allows collection of up to 16,384 data samples on one channel, or up to 4096 samples on eight channels. The unique graphical editing capability allows scrolling two cursors through a data plot to show the numerical values at each point and their difference. This allows users to compare tabular data without losing the benefits of the graphic display. UnkelScope also allows users to perform curve fitting to portions of their data, and to compute enclosed areas.

## Models

UnkelScope comes in three models which feature increasing capacity for larger projects.

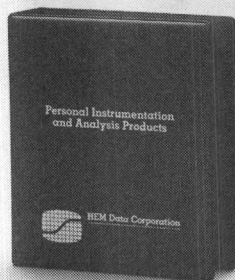
- UnkelScope Junior provides up to 4 channels and up to 8192 samples.
- UnkelScope Level 1 provides up to 16384 samples and up to 8 channels, as well as experiment control and process control features.
- UnkelScope Level 2+ adds signal processing and more procedures to the same sampling and channel capacity as Level 1.



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# SNAPSHOT

STORAGE SCOPE™  
SNAPCALC™  
SNAP-FFT™



## Specifications:

### SNAPSHOT STORAGE SCOPE

- Hardware Requirements:
  - IBM PC/XT/AT or compatible; 640KB RAM; CGA, EGA or Hercules graphics; co-processor recommended.
  - CONTEC Interface boards:  
ADC-100/200/300
- Input/Output Configuration
  - Analog inputs:  
16 single-ended or 8 differential
  - Analog outputs: 2
  - Digital inputs: 8
  - Digital outputs: 8
- Sampling Rate:
  - Minimum: 4/hr
  - Maximum: 40,000 Hz (gain 1, 10)  
25,000 Hz  
(gain 100, 200 with ADC-300)
- Number of data points:
  - Minimum: 10 per channel
  - Maximum: 32,000 total
- Trigger type: Free-running, analog or digital

- Display:  
Plots of X-T or X-Y
  - Up to 8 traces at a time
  - Dual cursors to provide time and magnitude readouts in engineering units

### SNAP-CALC

Enhances basic analysis and signal processing capabilities

- Functions Available:
  - Arithmetic
  - Calculus
  - Correlation
  - Differentiation
  - Integration
  - Logarithmic
  - Stastical
  - Trigonometric

## Features:

- SNAPSHOT STORAGE SCOPE converts an IBM PC/XT/AT or compatible machine into a stoarge oscilloscope using CONTEC analog I/O boards
- Replaces strip chart recorders, oscilloscopes, spectrum analyzers, X-Y plotters, waveform generators and filters in the laboratory
- SNAP-CALC analyzes test data concurrently or after data capture is complete
- SNAP-FFT enables frequency spectrum analysis
- All operations totally menu-driven

Toll Free Number 1-800-888-8884



## **Specifications** (Continued)

### **SNAP-FFT**

#### Frequency spectrum analysis

- Amplitude and phase
- Amplitude ratio of any two sets of channels and the difference in phase angle
- Power spectral density
- Relative power within specified frequency bands

## **Functional Description**

### **SNAPSHOT STORAGE SCOPE**

emulates both a storage oscilloscope and data acquisition system to acquire, display, analyze, store and retrieve data. It is completely menu-driven, allowing even the least computer-literate users to perform useful work quickly. It provides instantaneous feedback on each instrument-type entry, and calculates minimum, maximum and average values for captured waveforms. SNAPSHOT features a full range of display options, including choice of units, dual cursor readouts, and choice of graphical or tabular formats.

SNAP-CALC is an optional integrated analysis package which works with SNAPSHOT STORAGE SCOPE. It provides a long list of mathematical calculations, including integration,

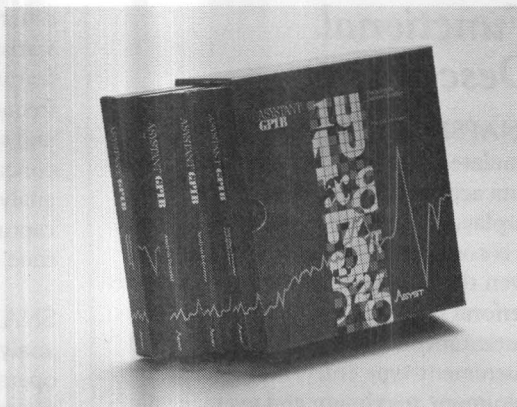
differentiation, correlation and other statistical functions. SNAP-CALC features a macro capability to store frequently used constants, equations, and subroutines. In addition, it offers concurrent data acquisition and analysis, allowing users to display both captured and calculated data in real-time.

SNAP-FFT is a frequency spectrum analysis software package which operates either independently or in concert with SNAPSHOT STORAGE SCOPE. It converts time domain data to the frequency domain using a fast fourier transform algorithm, and calculates both amplitude and phase values. SNAP-FFT analyzes up to four data channels, and calculates transfer functions and impedances. It also provides a completely menu-driven user interface and a range of plotting and display options.

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# ASYSTANT GPIB

*Integrated Data  
Acquisition and Control  
with IEEE-488 Support*



## Specifications

### GPIB Specifications

- Board configuration:
  - One board per system
  - Board status: System Controller
  - Polled operation mode
- Device configuration:
  - 1-12 devices
  - 0-30 primary addresses plus secondary addresses
  - 0-30 minute time-outs
- Controller functions and bus commands:
  - Initialize
  - Device clear
  - Selected device clear
  - Go to local
  - Local lockout
  - Serial polling with masks
  - Group execute trigger
  - TALK
  - LISTEN, TALK/LISTEN

- Buffers:
  - Up to 9, maximum 64KB each, total buffer space is memory dependent
- EOS (End of String)
  - 1 EOS Byte, 8 bit EOS masking, optional on TALK and LISTEN
- EOI (End or Identify)
  - Automatic on LISTEN, optional on TALK
- Macro configuration 30 routines maximum
- Programmable options.
  - Buffer and parameter set up
  - Controller functions and bus commands
  - Analysis and plotting commands
  - Table printing
  - User messages and prompts
  - Pause conditions (time, keystroke and SRQ)

### System Specifications

- Data Types:
  - Integer, real and complex; single and double precision; Arrays and scalars

## Features

- Integrated – instrument interfacing and control, analysis, statistics and graphics in a single package
- Menu-driven, High level – simple English-based commands for sophisticated operations
- Programmable – automates data acquisition, analysis and display routines
- Operates with CONTEC GPIB – IEEE488 interface board for IBM PC/XT/AT or compatible computers

## Specifications (Continued)

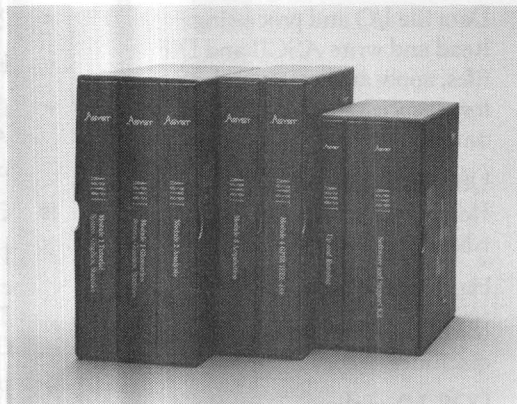
- Numerical operations:  
Arithmetic, trigonometric, hyperbolic, exponential and logarithmic functions. All functions work with all data types
- Array and matrix operation
- Graphics
- Waveform processing and generation
- Statistics
- Curve fitting
- Polynomial operations
- Differential equations
- Data file I/O and processing:  
Read and write ASCII and DIF files, apply arithmetic and waveform processing to waveforms on disk
- Utilities:  
Help system, DOS operations, text editor, calculator
- Hardware Required
- IBM PC/XT/AT or compatible machines
- DOS 2.0 or above
- Intel 8087/80287/80387 math co-processor
- 512K RAM, (640K recommended)
- 25-pin standard printer port
- Hard disk and one floppy drive
- IBM CGA, EGA, VGA, Hercules, AT&T or compatible graphics board
- Optional
- Printers: IBM graphics printers and compatibles, Epson, HP LaserJet, TI 855/865, IBM Proprinter, Okidata Microline 182
- Plotters: HP 7440, HP 7470, Gould Colorwriter #2 Plotters, or any HPGL plotter (paper size A and B)
- LIM (Lotus/Intel/Microsoft) standard expanded memory



3-YEAR  
WARRANTY

# ASYST

## Fully Programmable Scientific Software



## Specifications

### Modules 1 and 2: Base system, Analysis, Statistics, Graphics and RS-232 Interfacing

- Basic Math: Complete arithmetic, trigonometric, exponential and logarithmic functions
- Number types: Single and double precision integer, real and complex data
- File conversions: To and from ASCII, BASIC, packed binary and Lotus 1-2-3 files
- Utilities: Text editor, array and command-line editors, error tracer
- Special Functions
  - Waveform processing including FFT
  - Curve fitting
  - Polynomial and Matrix math
  - Statistics
  - Graphics
  - RS-232 Interfacing

### Module 3: Data Acquisition and Control

- With A/D, D/A Converters
  - Single or multiple channel input
  - Multiple boards simultaneously
  - Time, threshold and digital triggering
  - DMA support (\*)
  - Programmable input gain (\*)
  - Support of background/foreground operation
  - Internal/external clockings (\*)
  - Digital I/O (\*)
- (\*) = Hardware dependent

### Module 4: For GPIB/IEEE-488

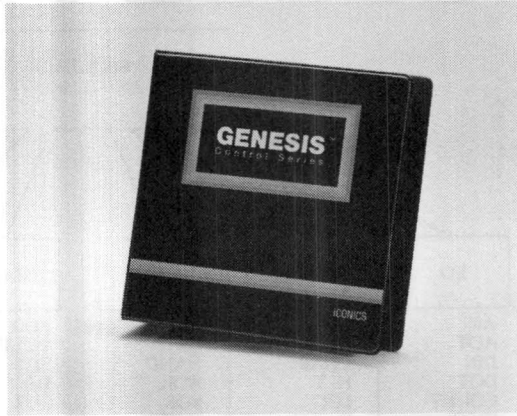
- Device independent commands
- Synchronous and asynchronous operations
- DMA acquisition
- Parallel and serial polling

## Features

- Integrated – data acquisition, analysis, statistics and graphics in a single package
- High level – single, English-based commands for sophisticated operations
- Modular construction
- Extendable – commands
- Menus and application programs can be customized
- Operates with CONTEC analog and digital interface boards for IBM PC/XT/AT or compatible machines
- Triggering
- Array buffering of data
- Hardware Required
  - IBM PC/XT/AT or compatible machines
  - DOS 2.0 or above
  - Intel 8087/80287/80387 math co-processor
  - 512K RAM, (640K recommended)
  - 25-pin standard printer port
  - Hard disk and one floppy drive
  - IBM CGA, EGA, VGA, Hercules, AT&T or compatible graphics board
- Optional
  - CONTEC Interface boards supported: ADC-100/200/300, GPIB

# GENESIS

## CAD Data Acquisition and Control Software



## Features

- Real-Time, Multi-Tasking data collection system with graphical operator interface
- Operates on IBM PC/XT/AT or compatible machines
- Compatible with CONTEC PC interface boards
- Available for Control or SCADA applications
- ICON-driven graphics display builder
- Alarm, event and report logging
- Historic data archive and replay
- Real-time and historic trending
- LOTUS 1-2-3 compatible
- Password protection

## Specifications

- I/O Points: 400 – 500
- Number of blocks: 350 – 800
- Devices:
  - Number of device drivers: 6
  - Number of devices: 42
  - Number of communication ports supported: 2
- Serial communication speed: up to 19.2K baud
- Performance
  - I/O point scan rate: 0.1, 0.25, 0.5, 1, 2, 6, 12, 30, 250 msec max
- Display update: 250 msec.
- Display access: 1 – 4 sec.
- Number of displays: Limited by disk size only
  - Display size: 1 – 25 KB
- Dynamic connections per display: 100
  - Process points: 40
  - Data entry points: 20
  - Initialized data entry: 40
- Display data types:
  - Numerical analog
  - Bar graph
  - Trend window
  - Logical ON/OFF color change
  - Logical ON/OFF text
  - Message
  - Data entry point
- Trend Windows:
  - Number per page: no limit
  - Pens per window: 3
  - Update rate  $\geq 1$  sec
  - Window time span: 30 sec – 48 hr
  - Number of samples per window: 30
- System trend
  - Number of variables: 20
  - Number of pens: 5
  - Time span: 1 min – 24 hr.
  - Update rate:  $\geq 1$  sec.
  - Number of snapshots: 20
- Event Driven Historian:
  - Number of open files: 14
  - Number of variables per file: 20
  - Sample rates (per file): 0.1, 0.25, 0.5, 1, 2, 6, 12, 30

- Sample rate selection: Can be configured or externally supplied
- Shift Historian:
  - Number of variables: 23
  - Sample rate: 10 sec.
  - Samples per record (averaged)
  - Hourly file: 3
  - Shift file: 24
  - Daily file: 72
  - Weekly file: 216
- Alarm Priority Levels: 10
- Password Security Levels: 3
- Hardware Requirements:
  - IBM PC/XT/AT or compatible
  - CPU: 80286 or 80386
  - Operating system: DOS/MSDOS
  - Memory: 640 KB RAM
  - Hard disk: 10MB min.
  - Floppy disk: 1.2 MB
  - Math co-processor: 8087 or 80287
  - EGA or VGA card with 256 KB memory
  - EGA or VGA color monitor
  - 1 serial port
  - 1 parallel port

3-YEAR  
WARRANTY

## GENESIS

### Specifications (Continued)

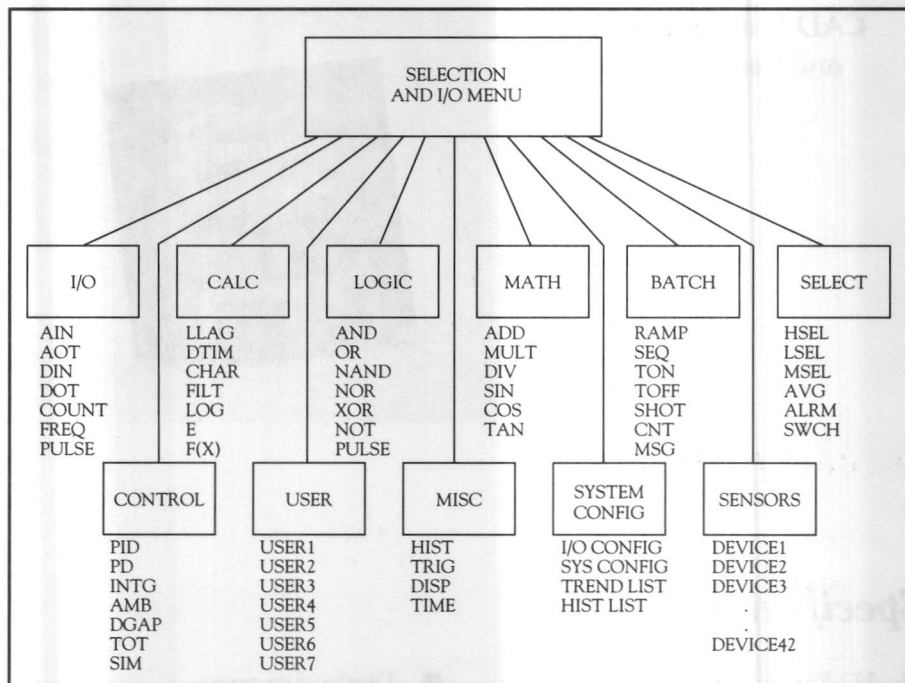
- 1 mouse (3 button recommended) required for configuration only
- Interface boards: Any one or more of the following:  
ADC-30, ADC-30 with ATP-M, ADC-40, ADC-100/200/300, PI-32, PO-32, PIO-16/16, PIO-24/24, PIO-48W/R/C, PIO-96W
- Optional Hardware
- Graphics printer: Epson FX-80 or equivalent
- Color graphics printer: Xerox 4020
- Copy Protection: Hardware key is required for operation. Software may be copied.

### Functional Description

GENESIS consists of two main parts: The System Configurator running under DOS, which includes the Process Builder and the Graphics Builder; and the Run-Time Multi-Tasking control system co-resident with DOS, which executes the data collection system and provides a graphical operator interface.

The GENESIS Process Builder provides a CAD environment to graphically create and edit data acquisition and control strategies. It is possible to select from a library of acquisition, control, logic and calculation icons, position them on the screen and connect them according to the desired strategy. The system automatically flags all errors and provides an opportunity to correct them.

GENESIS supports up to six drivers simultaneously. Each driver can support multiple devices. This enables devices,



such as Plug-in interface boards, Distributed I/O subsystems, Loop Controllers and Programmable Logic Controllers from the same or different manufacturers to be used in the same system, up to a system total of 42 devices.

The System Configurator allows allocation of GENESIS resources to suit the specific application. The system configurator can specify communication port parameters, printer port allocation, I/O scan time, screen update rate, default password and security level, short term trend and historian variables.

The Graphics Builder provides a powerful set of CAD tools to generate dynamic Run-Time graphic displays.

The Dynamic Connection functions enable the following:

- Dynamic Size
- Dynamic Color
- Data Entry and Initialized Data Entry
- Process Point
- Trend Windows

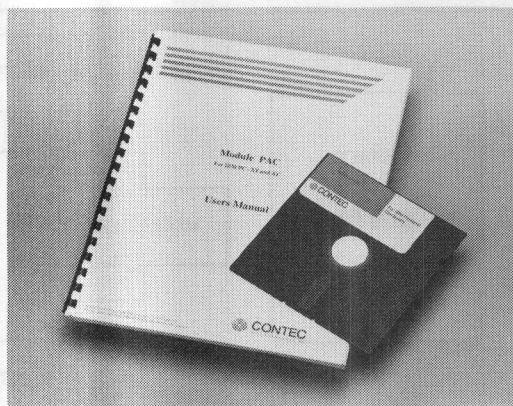
GENESIS provides a powerful and flexible means of creating display hierarchies of unlimited size.

The GENESIS Run-Time System is a real-time process management and control function built-around a powerful real-time multi-tasking operating system which is co-resident with DOS.



# MODULE-PAC

**Release 2**



## Features

- Memory resident driver facilitates programming of analog and digital I/O
- Supports CONTEC ADC and PIO series of interface boards for IBM PC/XT/AT or compatible machines
- Can be called from BASICA, GWBASIC, QUICK BASIC or Microsoft C
- Easy, menu driven, program for configuring interface boards
- Access by user defined channel numbers

## Specifications

- Capacity
  - Number of boards: 10 max., any mix of ADC or PIO boards
  - Number of channels: 256 max.
- Input/Output
  - One shot input/output
  - Conditional continuous input/output
  - Inputs with DMA for ADC-100/200/300
- A/D, D/A conversion control
  - Software
  - External interrupt input/output, IRQ 2 through IRQ 7
  - Time interval input/output
- List of files
  - MDLPAC.EXE: main driver file
  - MPSET.EXE: setup MODULE-PAC environment file
  - MPBS.BIN: interface routine for BASICA or GWBASIC
  - MPQB.QLB: interface routine for QUICKBASIC
  - MPCS.OBJ: interface routine for C, small model
  - MPCM.OBJ: interface routine for C, medium model
  - MPCC.OBJ: interface routine for C, compact model
  - MPCL.OBJ: interface routine for C, large model
  - MDLCFG.EXE: Module-PAC configuration file maker
- System Requirements
  - IBM PC/XT/AT or compatible machine
  - DOS 2.0 or later
  - Memory minimum: 384 Kbytes
  - CONTEC interface boards, any one or more of: ADC-10, ADC-20, ADC-30, ADC-40, ADC-100, ADC-200, ADC-300, PI-32, PO-32, PIO-16/16, PIO-24/24, PIO-48W/R/C, PIO-96W

3-YEAR  
WARRANTY

## MODULE-PAC

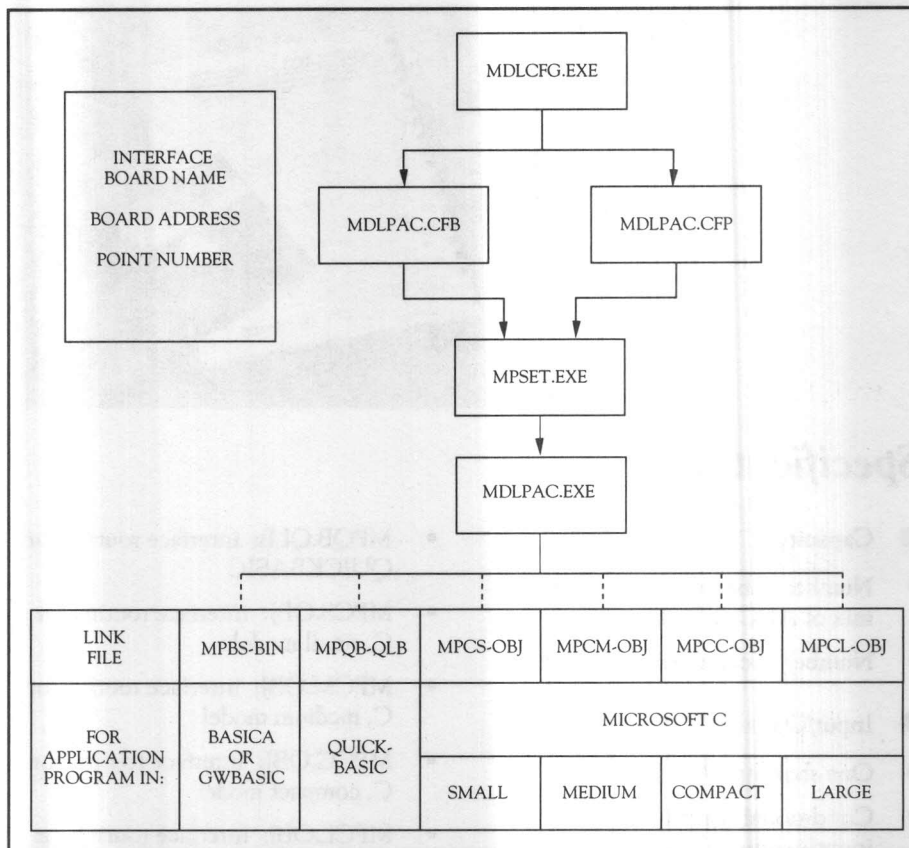
### Functional Description

This package contains drivers for CONTEC analog and digital I/O boards for the IBM PC/XT/AT or compatible machines.

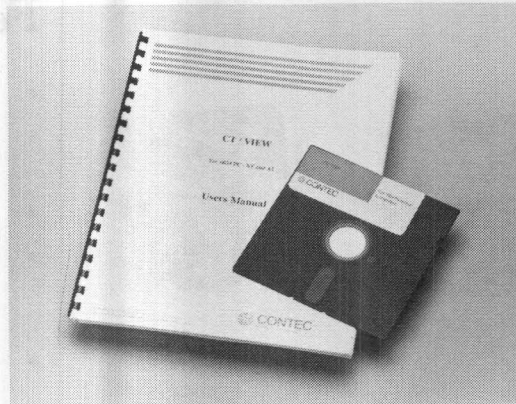
MODULE-PAC is a menu-driven software, which enables the user to configure a system containing analog and digital I/O. The drivers can be called in either BASICA, GWBASIC, QUICK BASIC or Microsoft C.

The MDLCFG.EXE helps set up configuration files MDLPAC.CFB and MDLPAC.CFP, which contain information on interface board name, board address, channel number etc. These configuration files are read into MDLPAC.EXE, the main driver file of MODULE-PAC by means of MPSET.EXE. After running MDLPAC.EXE once, it resides in the memory.

Interface routines, MPBS.BIN for BASICA and GWBASIC, MPQB.QLB for QUICKBASIC, MPC (S, M, C, L) .OBJ for small, medium, compact, large models in Microsoft C, are provided. Depending on the language in which the application program is written, the user can call up the required interface routine.



# CT/VIEW



## Features

- Menu-driven program for Data Acquisition
- Runs under MS-DOS
- Supports CONTEC analog and digital interface boards for IBM PC/XT/AT or compatible machines
- Acquired data displayed in tabular, graphic or bar form
- Data can also be saved on disk
- Variable scan rate
- Command summary provided

## Specifications

- Capacity
  - Number of boards: 5 max., any mix of ADC or PIO boards
  - Number of channels: Analog: 8 max. Digital: 16 max.
- System Requirements
  - IBM PC/XT/AT or compatible machine
  - DOS 2.0 or later
  - Memory minimum: 384 Kbytes
  - CONTEC interface boards, any one or more of: ADC-10, 20, 30, 40, ADC-100, 200, 300, PI-32, PO-32, PIO-16/16, PIO-24/24, PIO-48W/R/C, PIO-96W

## Functional Description

CT/View is a menu-driven program for data acquisition, using CONTEC analog and digital interface boards for IBM PC/XT/AT or compatible machines.

It consists of a number of screens for set-up and display, which are accessed using function keys or pull-down menus. The user can set/reset parameters such as:

- number of channels
- conversion value for each analog channel: full scale range, engineering unit
- names for digital channels
- type of display
- scan rate
- save/retrieve set up values
- save/retrieve set up data

CT/View

Board setup menu  
Add Delete Clear

ADC series  
PIO

Current Board Configuration  
 Number of Board = 4  

| Board#                      | Name  | Base Address |
|-----------------------------|-------|--------------|
| Enter base address(HEX) 220 |       |              |
| 4                           | ADC30 | 200          |

Enter base address  
Use arrow keys, then press <Enter> Return to previous menu <ESC>

Exit <Ctrl-Enter>

Set acquisition data configuration table

| ANALOG  |        | scale |      | display |       | #data   | speed | #disp   | color |
|---------|--------|-------|------|---------|-------|---------|-------|---------|-------|
| point#  | name   | min   | max  | min     | max   |         |       |         |       |
| 1       | Volt   | 0     | 4095 | -10     | 10    | 100     | 200   | 100     | 2     |
| 4       | Temp F | 0     | 4095 | 50      | 200   | 0       | 100   | 50      | 10    |
| 7       | Gallon | 0     | 4095 | 0       | 300   | 0       | 50    | 50      | 12    |
| 8       | Volt   | 0     | 4095 | -5      | 5     | 200     | 100   | 50      | 14    |
| 9       | Speed  | 0     | 4095 | 0       | 200   | 0       | 20    | 50      | 5     |
| 10      | rpm    | 0     | 4095 | 0       | 8000  | 0       | 500   | 50      | 8     |
| DIGITAL |        | state | name | #data   | speed | outdata |       | #data   | speed |
| point#  | name   |       |      |         |       | min     | max   |         |       |
| 2       | Temp F | 0     | 4095 | 50      | 200   | 75      |       | 0       | 100   |
| 3       | RUN    | on    | off  | STOP    | 0     | 100     |       | 0       | 100   |
| 5       | ON     | on    | off  | OFF     | 0     |         |       | outdata |       |

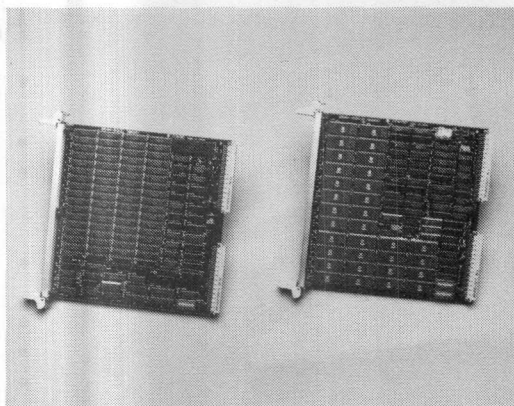
Enter scale unit



3-YEAR  
WARRANTY

# SRAM 512/SRAM 1000

## Memory Boards



## Features

- Full Multibus II compatibility
- Zero wait state operation on iLBX™ II Bus (SRAM 512 only)
- Battery memory backup
- Dynamic memory configuration over Multibus II interconnect support without jumpers
- Hardware interconnect support with DIP-switches
- Selectable base address
- JEDEC memory sockets (SRAM 1000 only)

## Specifications

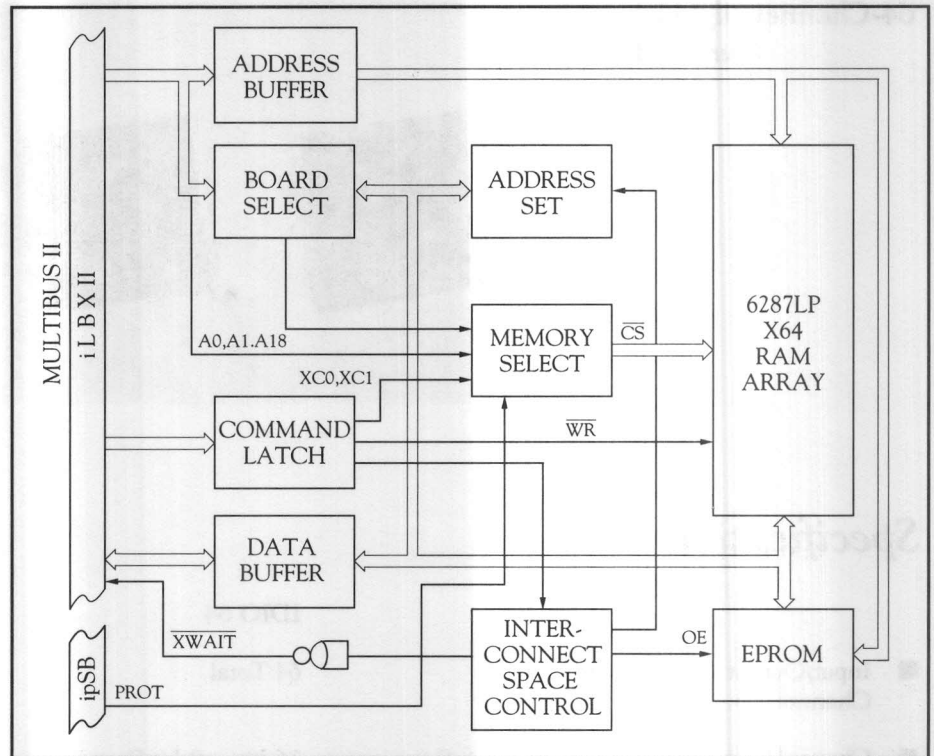
|                       | SRAM 1000                | SRAM 512                |
|-----------------------|--------------------------|-------------------------|
| ■ Memory Capacity     | 1 M EPROM or SRAM        | 512 K SRAM              |
| ■ Access Time         | 600 ns (iPSB Bus 10 MHz) | 250 ns (iLBX Bus 8 MHz) |
| ■ Data Length         | 8, 16, 24, 32 bits       | 8, 16, 24, 32 bits      |
| ■ Base Address        | Any 64 Kbyte boundary    | Any 64 Kbyte boundary   |
| ■ Voltage             | 5 VDC $\pm 5\%$          | 5 VDC $\pm 5\%$         |
| ■ Power               | 2.3 A (typical)          | 1.5 A (typical)         |
| ■ Backup Battery      | 3.6 VDC, 50 mAh          | 3.6 VDC, 50 mAh         |
| ■ Backup Battery Life | 48 hours typical         | 24 hours typical        |
| ■ Operating Temp.     | 0 to 60°C                |                         |
| ■ Storage Temp.       | -40 to 70°C              |                         |
| ■ Relative Humidity   | 0 to 90% Non-condensing  |                         |
| ■ Size                | 223 mm x 220 mm          |                         |

## Functional Description

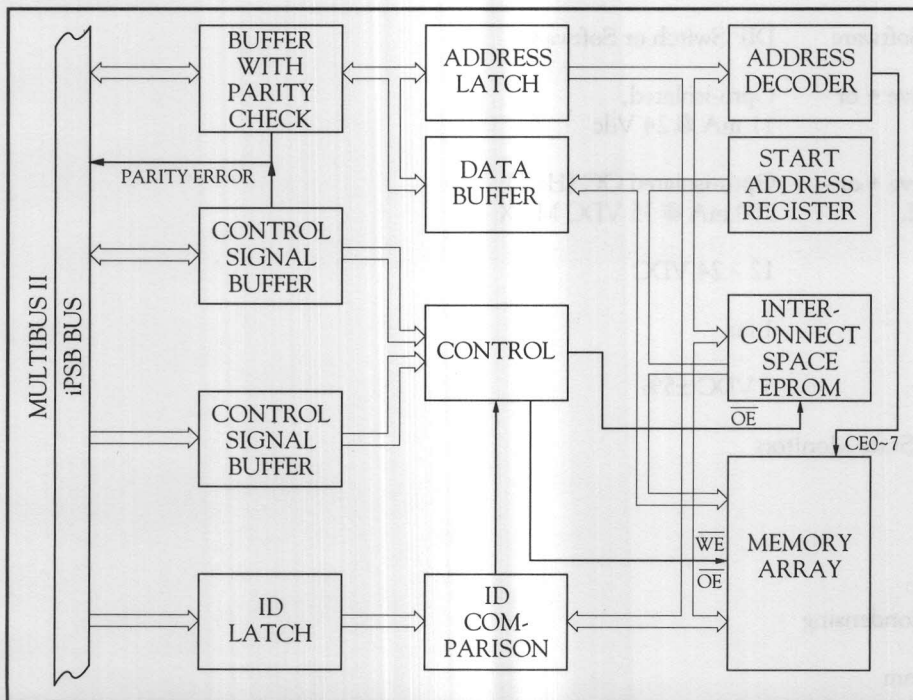
The CONTEC SRAM 512 and SRAM 1000 are Multibus II-compatible memory boards. The SRAM 512 features high-speed CMOS static RAM with no wait state operation over Local Bus Extension (iLBX II).

The SRAM 1000 features JEDEC 28-pin DIP memory sockets for use with standard RAM, ROM, and EPROM devices.

Both boards have full battery backup, while the SRAM 512 can also use power from the Parallel System Bus (iPSB II) to maintain memory contents.



## SRAM 1000



## SRAM 512

### Interconnect Space

The SRAM 512 and SRAM 1000 boards support the interconnect space on the Multibus II system. The configuration data of the board can be verified and programmed from user's program.

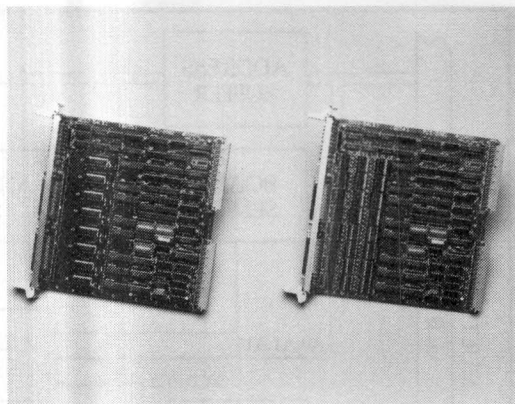
### Programming

The SRAM 512 and SRAM 1000 boards are programmed through Interconnect Template registers, accessible through iLBX and iPSB buses, respectively. By accessing the Interconnect Space, user-supplied software may change the boards' memory configuration, set their starting addresses, or read various configuration information.

3-YEAR  
WARRANTY

# DDIO 64/IDIO 64

## 64-Channel Digital Input/ Output Boards



## Features

- Full Multibus II compatibility
- Opto-coupled isolation on all channels (IDIO 64 only)
- 64 I/O channels for Parallel System Bus (iPSB)
- Channels configurable to 8-bit words
- Multibus II interconnect space support
- 16 status display LEDs
- Hardware reset at power-on

## Specifications

|                         | DDIO 64                                       | IDIO 64                                         |
|-------------------------|-----------------------------------------------|-------------------------------------------------|
| ■ Input/Output Channels | 64 Total                                      | 64 Total                                        |
| ■ Channel Configuration | 16-bit or 8-bit Segments                      | 16-bit or 8-bit Segments                        |
| ■ Board Selection       | DIP Switch or Software                        | DIP Switch or Software                          |
| ■ Input Signal Level    | TTL-level, Active + or -                      | Opto-isolated,<br>11 mA @ 24 Vdc                |
| ■ Output Signal Level   | TTL-level, Active + or -,<br>OC (Hi-Z) avail. | Opto-isolated OC (Hi-Z),<br>200 mA @ 35 VDC MAX |
| ■ External I/O Power    | —                                             | 12 - 24 VDC                                     |
| ■ Response Time         | —                                             | 1 ms                                            |
| ■ Logic Power           | 5 VDC $\pm$ 5%                                | 5 VDC $\pm$ 5%                                  |
| ■ LED Display           | 16 I/O Register State Monitors                |                                                 |
| ■ Operation Temperature | 0 to 60°C                                     |                                                 |
| ■ Storage Temperature   | -40 to -70°C                                  |                                                 |
| ■ Relative Humidity     | 0 to 90% Non-condensing                       |                                                 |
| ■ Size                  | 223 mm x 220 mm                               |                                                 |



## Functional Description

The CONTEC DDIO 64 and IDIO 64 are fully Multibus II compatible input/output boards for users building Multibus II systems.

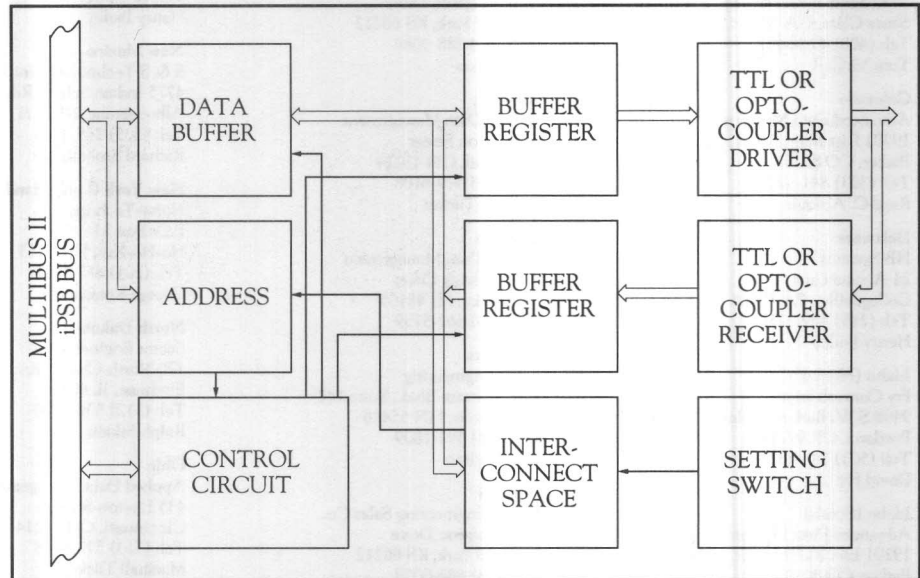
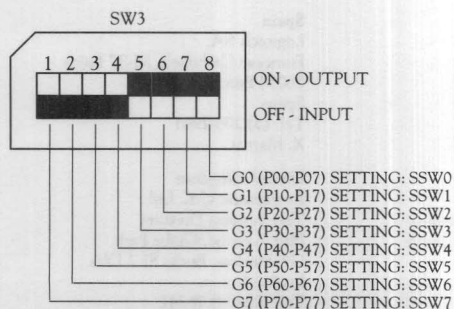
The DDIO 64 features Active High or Active Low TTL-level input and output levels, plus open-collector (Hi-Z) outputs.

The IDIO features opto-isolated inputs and outputs, for applications requiring isolating the board from external devices.

Both boards have 64 channels which may be configured as either inputs or outputs, and in four 16-bit or eight 8-bit segments. Both boards may be configured either by on-board DIP switches or by software commands.

## Input/Output Configuration

The channels on the DDIO 64 and IDIO 64 boards are configured as inputs or outputs by using either software instructions or an on-board DIP switch, SW3. Figure 1 shows how to set SW3: In addition, the opto-couplers on the IDIO 64 board must be configured to act as either input or output drivers.



## Monitor LEDs

The DDIO 64 and IDIO 64 boards each have two banks of eight LEDs for monitoring the state of the board's ports. These LEDs are active when the I/O signal they monitor is active. In addition, two more LEDs on each board indicate which bank of ports is being monitored, as chosen by a push switch located immediately below. Figure 3 shows the LED arrangement and their assignments.

| G6  | G4  | G2  | G0  |          | G1  | G3  | G5  | G7  |
|-----|-----|-----|-----|----------|-----|-----|-----|-----|
| P67 | P47 | P27 | P07 | 7 ○ F ○  | P17 | P37 | P57 | P77 |
| P66 | P46 | P26 | P06 | 6 ○ E ○  | P16 | P36 | P56 | P76 |
| P65 | P45 | P25 | P05 | 5 ○ D ○  | P15 | P35 | P55 | P75 |
| P64 | P44 | P24 | P04 | 4 ○ C ○  | P14 | P34 | P54 | P74 |
| P63 | P43 | P23 | P03 | 3 ○ B ○  | P13 | P33 | P53 | P73 |
| P62 | P42 | P22 | P02 | 2 ○ A ○  | P12 | P32 | P52 | P72 |
| P61 | P41 | P21 | P01 | 1 ○ 9 ○  | P11 | P31 | P51 | P71 |
| P60 | P40 | P20 | P00 | 0 ○ 8 ○  | P10 | P30 | P50 | P70 |
| ●   | ●   | ●   | ●   | 2 ○ 2' ○ | ●   | ●   | ●   | ●   |

○ ON  
● OFF

## Programming

The DDIO 64 and IDIO 64 boards are programmed via the I/O space on the iPSB bus. User can reassign the board address or read various configuration information through the interconnect space.

# List of Representatives

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### Arizona

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Tom McCall

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George Rosazza

### New Jersey (South)

HB Systems  
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David Fry

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Patrick Irwin

# List Prices

| Product Number                          | Product Name                        | List Price | Product Number                            | Product Name                           | List Price |
|-----------------------------------------|-------------------------------------|------------|-------------------------------------------|----------------------------------------|------------|
| <b>BOARDS FOR IBM PC/XT/AT</b>          |                                     |            | <b>BOARDS FOR IBM PS/2 - Microchannel</b> |                                        |            |
| <b>Analog Series</b>                    |                                     |            | <b>Analog Series</b>                      |                                        |            |
| 101 1040                                | ADC10: ANALOG INPUT - AUTOCAL       | \$695.00   | 201 1050                                  | mADC30: LOW-COST ANALOG INPUT          | \$595.00   |
| 101 1045                                | ADC20: ANALOG OUTPUT - AUTOCAL      | \$695.00   | 201 1060                                  | mADC150: MULTIFUNCTION ANALOG          | \$995.00   |
| 101 1050                                | ADC30: LOW-COST ANALOG INPUT        | \$345.00   | 201 1070                                  | mADC350: MULTIFUNCTION - PRG. GAIN     | \$1,150.00 |
| 101 1055                                | ADC40: LOW-COST ANALOG OUTPUT       | \$485.00   |                                           |                                        |            |
| 101 1060                                | ADC50: ANALOG INPUT - PRG. GAIN     |            | <b>Digital Series</b>                     |                                        |            |
| 101 1070                                | ADC80: 8 CH ANALOG OUTPUT           |            | 211 0020                                  | mPI48L: 48 INPUTS 12-24VDC             | \$450.00   |
| 101 0100                                | ADC100: MULTIFUNCTION ANALOG        | \$945.00   | 211 0025                                  | mPI48T: 48 INPUTS TTL-LEVEL            | \$295.00   |
| 101 0101                                | ADC200: MULTIFUNCTION ANALOG        | \$995.00   | 211 0030                                  | mPO48L: 48 OUTPUTS 12-24VDC            | \$450.00   |
| 101 0102                                | ADC300: MULTIFUNCTION - PRG. GAIN   | \$995.00   | 211 0035                                  | mPO48T: 48 OUTPUTS TTL-LEVEL           | \$295.00   |
| 101 0104                                | ADC400: HIGH-SPEED ANALOG           | \$1,150.00 | 211 0040                                  | mPIO24/24L: (24IN+24OUT) 12-24VDC      | \$450.00   |
|                                         |                                     |            | 211 0045                                  | mPIO24/24T: (24IN+24OUT) TTL-LEVEL     | \$295.00   |
| <b>Digital Series</b>                   |                                     |            | <b>Communication Series</b>               |                                        |            |
| 111 0080                                | PI-32L: 32 INPUTS 12-24VDC          | \$295.00   | 221 0010                                  | mCOM8A: 8CH RS232C                     | \$695.00   |
| 111 0082                                | PI-32T: 32 INPUTS TTL-LEVEL         | \$225.00   | 221 0020                                  | mCOM8B: 8CH RS422                      | \$695.00   |
| 111 0081                                | PI-32H: 32 INPUTS 48-60VDC          | \$345.00   | 221 0030                                  | mICOM8A: 8CH RS232C - INTELLIGENT      | \$1,235.00 |
| 111 0100                                | PO-32L: 32 OUTPUTS 12-24VDC         | \$295.00   | 221 0040                                  | mICOM8B: 8CH RS422 - INTELLIGENT       | \$1,235.00 |
| 111 0102                                | PO-32T: 32 OUTPUTS TTL-LEVEL        | \$225.00   |                                           |                                        |            |
| 111 0101                                | PO-32H: 32 OUTPUTS 48-60VDC         | \$345.00   | <b>ACCESSORIES</b>                        |                                        |            |
| 111 0040                                | PIO-16/16L: (16IN+16OUT) 12-24VDC   | \$295.00   | 108 0010                                  | ATP-1: BNC TERMINAL PANEL              | \$315.00   |
| 111 0042                                | PIO-16/16T: (16IN+16OUT) TTL        | \$225.00   | 108 0020                                  | ATP-2: SCREW TERMINAL PANEL            | \$105.00   |
| 111 0041                                | PIO-16/16H: (16IN+16OUT) 48-60VDC   | \$345.00   | 108 0050                                  | ANALOG PROBE                           | \$65.00    |
| 111 0120                                | PIO-24/24L: (24IN+24OUT) 12-24VDC   | \$320.00   | 108 0060                                  | ATP-M ANALOG INPUT MULTIPLEXER         | \$365.00   |
| 111 0132                                | PIO-48W: 48 BIDIRECTIONAL I/O       | \$145.00   | 108 0070                                  | ATPM2 ANALOG INPUT MULTIPLEXER         | \$450.00   |
| 111 0134                                | PIO-48C: 48 I/O + 3 COUNTERS        | \$175.00   | 108 0080                                  | UTP1: UNIVERSAL TERMINAL PANEL         | \$105.00   |
| 111 0138                                | PIO-48R: 48 I/O + SER. COMMN.       | \$295.00   | 108 1011                                  | SC210-1: ISOL. I/P MODULE ±1V          | \$140.00   |
| 111 0160                                | PIO-96W: 96 BIDIRECTIONAL I/O       | \$245.00   | 108 1012                                  | SC210-2: ISOL. I/P MODULE ±5V          | \$140.00   |
|                                         |                                     |            | 108 1013                                  | SC210-3: ISOL. I/P MODULE ±10V         | \$140.00   |
| <b>Counter/Timer Boards</b>             |                                     |            | 108 1021                                  | SC211-1: ISOL. WB MODULE ±1V           | \$140.00   |
| 121 0010                                | CNT16-4M: 4 COUNTER/TIMERS          | \$445.00   | 108 1022                                  | SC211-2: ISOL. WB MODULE ±5V           | \$140.00   |
| 121 0020                                | TCG-10: 10 COUNTER/TIMER/GENERATORS | \$595.00   | 108 1023                                  | SC211-3: ISOL. WB MODULE ±10V          | \$140.00   |
| <b>Communication Interfaces</b>         |                                     |            | 108 1031                                  | SC220-1: ISOL. TC MODULE ±25mV         | \$140.00   |
| 131 0010                                | GPB: IEEE-488 COMMUNICATION         | \$265.00   | 108 1032                                  | SC220-2: ISOL. TC MODULE ±50mV         | \$140.00   |
| 131 0015                                | COM-4M: 4 CH RS232/RS422            | \$395.00   | 108 1033                                  | SC220-3: ISOL. TC MODULE ±100mV        | \$140.00   |
| 131 0100                                | ICOM8A: 8 CH RS232C - INTELLIGENT   | \$1,095.00 | 108 1041                                  | SC221-1: ISOL. WB MODULE ±25mV         | \$140.00   |
| 131 0110                                | ICOM8B: 8 CH RS422 - INTELLIGENT    | \$1,095.00 | 108 1042                                  | SC221-2: ISOL. WB MODULE ±50mV         | \$140.00   |
| 171 0200                                | CR-PAC: (CHASSIS, BRDS, CABLE)      | \$995.00   | 108 1043                                  | SC221-3: ISOL. WB MODULES ±100mV       | \$140.00   |
| 171 0204                                | BUS PC: BUS EXPANSION               | \$125.00   | 108 1051                                  | SC230-1: ISOL. RTD MODULE              | \$140.00   |
| 171 0206                                | BUS PAC: BUS EXPANSION RECEIVER     | \$125.00   | 108 1061                                  | SC240-1: ISOL. CURRENT LOOP I/P MODULE | \$140.00   |
| 171 0500                                | CR-NET: (CHASSIS, BRDS)             | \$1,185.00 | 108 1071                                  | SC280-1: ISOL. CURRENT LOOP O/P MODULE | \$140.00   |
| 171 0300                                | COM-2DS: COMMUNICATION CONTROLLER   | \$265.00   | 108 1081                                  | SC290-1: ISOL. VOLTAGE O/P MODULE      | \$140.00   |
| 171 0400                                | COM-NET: REMOTE CONTROLLER          | \$225.00   | 108 1091                                  | SC-16: BACPLANE FOR 16 MODULES         | \$250.00   |
| <b>Motor/Machine Control Interfaces</b> |                                     |            | 108 1092                                  | SC-16M: BACPLANE WITH MULTIPLEXER      | \$260.00   |
| 121 0015                                | IRT-16: 16 INTERRUPT INPUTS         | \$395.00   | 108 1093                                  | SC-08: BACKPLANE FOR 8 MODULES         | \$175.00   |
| 151 0010                                | STP-2M: STEPPER MOTOR CONTROLLER    | \$995.00   | 108 1094                                  | SC-01: BACPLANE FOR 1 MODULE           | \$35.00    |
| <b>Memory Series</b>                    |                                     |            | 108 1101                                  | SC-RK: 19" RACK FOR BACKPLANE          | \$60.00    |
| 141 0010                                | V-DISK 0MB                          | \$450.00   | 108 1102                                  | SC-PCP: 5' POWER CABLE FOR PC          | \$25.00    |
| 141 0011                                | V-DISK 1.2MB SRAM                   | \$1,340.00 | 108 1103                                  | SC-PS1: POWER SUPPLY - 120VAC/+5V      | \$125.00   |
| 141 0012                                | V-DISK 2.4MB SRAM                   | \$2,230.00 | 108 1104                                  | SC-CB1: 3' RIBBON CABLE                | \$25.00    |
| 141 0013                                | V-DISK 1.2MB EPROM                  | \$665.00   | 108 1105                                  | SC-ADS: SCREW TERMINAL ADAPTER         | \$50.00    |
| 141 0014                                | V-DISK 2.4MB EPROM                  | \$880.00   | 108 1106                                  | SC-USER: SC200 USERS MANUAL            | \$25.00    |
| 141 0015                                | V-DISK 1.2MB SRAM + 1.2MB EPROM     | \$1,550.00 | 108 1107                                  | SC-FS1: SPARE PARTS KIT                | \$20.00    |
| 141 0016                                | BU-RAM: BATTERY BACK-UP FOR SRAM    | \$145.00   | 118 0010                                  | DTP-1: SCREW TERMINAL PANEL            | \$95.00    |
| 141 0017                                | W-EPROM: EPROM BURNER + S/W         | \$245.00   | 118 0020                                  | DTP-2: SCREW TERMINAL PANEL            | \$95.00    |
|                                         |                                     |            | 118 0030                                  | DT CABLE                               | \$55.00    |
|                                         |                                     |            | 118 0040                                  | DT CABLE/B: WITH BRACKET               | \$40.00    |
|                                         |                                     |            | 118 0045                                  | DT CABLE/O: OPEN-ENDED                 | \$15.00    |
|                                         |                                     |            | 118 0050                                  | DTP-R: RELAY OUTPUT PANEL              | \$265.00   |
|                                         |                                     |            | 118 0060                                  | DTP-S: SSR TERMINATION PANEL           | \$195.00   |



| Product Number                 | Product Name                    | List Price | Product Number              | Product Name                     | List Price |
|--------------------------------|---------------------------------|------------|-----------------------------|----------------------------------|------------|
| <b>ACCESSORIES (continued)</b> |                                 |            | <b>SOFTWARE (continued)</b> |                                  |            |
| 118 0065                       | SSR: SOLID STATE RELAYS         | \$14.00    | 909 0105                    | UNKELSCOPE L1                    | \$349.00   |
| 138 0015                       | RS 422 CABLE: 2-TWISTED PAIRS   | \$80.00    | 909 0110                    | UNKELSCOPE JR                    | \$125.00   |
| 138 0016                       | RS 232 CABLE: 4-SHIELDED CABLES | \$100.00   | 909 0300                    | ACQUISITION ENGINE               | \$349.00   |
| 138 0010                       | DIV 422: DISTRIBUTION PANEL     | \$65.00    | 909 0400                    | ONSPEC - 286                     | \$3,995.00 |
| 138 0020                       | DIV 232C: DISTRIBUTION PANEL    | \$65.00    | 909 0500                    | SNAPSHOT STORAGE SCOPE           | \$495.00   |
| 138 0030                       | BOX FOR DISTRIBUTION PANEL      | \$45.00    | 909 0510                    | SNAP-FFT                         | \$395.00   |
| 158 0010                       | STP I/O CABLE                   | \$60.00    | 909 0550                    | SNAPSHOT + SNAPCALC              | \$890.00   |
| 161 0010                       | CM-32: CHECK-MATE               | \$495.00   | 909 0800                    | ASYSTANT GPIB                    | \$695.00   |
| 171 0100                       | FA-PAC: CHASSIS                 | \$695.00   | 909 0900                    | GENESIS CONTROL                  | \$3,495.00 |
| 178 0020                       | CR-PAC CABLE                    | \$100.00   | 909 0910                    | GENESIS SCADA                    | \$2,495.00 |
| 208 0010                       | MTP-2: SCREW TERMINAL PANEL     | \$105.00   | 909 1000                    | ASYST (MODULES 1+2+3)            | \$2,095.00 |
| 218 0010                       | MT/S CABLE                      | \$55.00    | 909 1010                    | ASYST (MODULES 1+2+3+4)          | \$2,295.00 |
| 218 0020                       | MT/68 CABLE                     | \$45.00    | 902 0010                    | CT/VIEW                          | \$75.00    |
| 218 0030                       | MT/34 CABLE                     | \$45.00    | 902 0020                    | MODULE-PAC                       | \$245.00   |
| 218 0040                       | MT/O CABLE                      | \$35.00    | 901 0010                    | "C" DRIVERS FOR ADC100/200/300   | \$45.00    |
|                                |                                 |            | 901 0020                    | "C" DRIVERS FOR ADC30            | \$45.00    |
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| 909 0010                       | LABTECH NOTEBOOK                | \$995.00   | 801 0010                    | SRAM 512: 0-WAIT STATE MEMORY    | \$2,500.00 |
| 909 0015                       | LABTECH ACQUIRE                 | \$195.00   | 801 0015                    | SRAM 1000: BATTERY-BACKED MEMORY | \$2,000.00 |
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| 909 0025                       | LABTECH CONTROL                 | \$2,995.00 | 801 0025                    | IDIO 64: 64 I/O 12-24VDC         | \$1,750.00 |
| 909 0100                       | UNKELSCOPE L2+                  | \$549.00   |                             |                                  |            |

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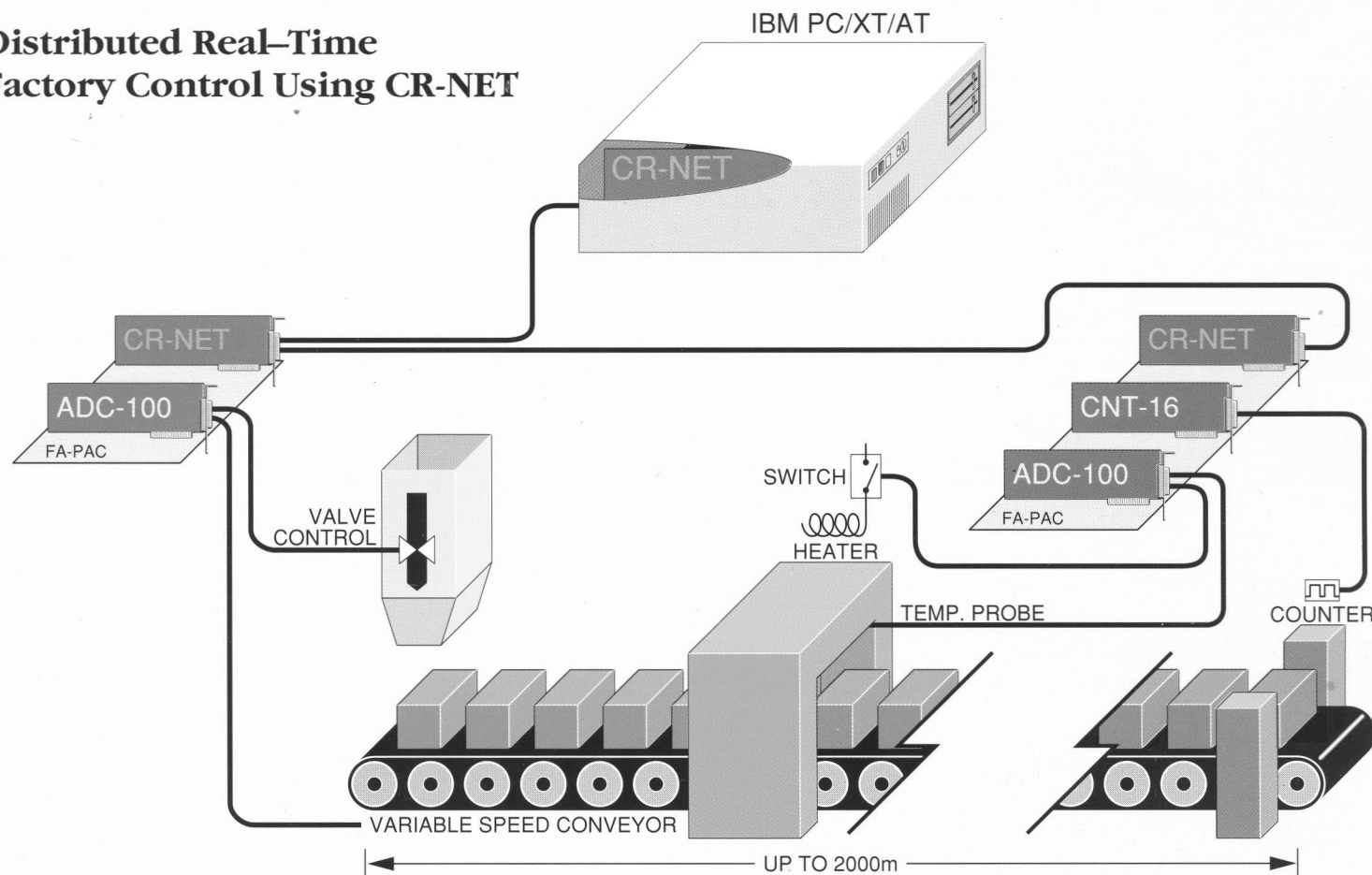
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## Distributed Real-Time Factory Control Using CR-NET



Without CR-NET, separate personal computers would be required at each location. Using CR-NET, the process runs on a single PC, with distributed control.

**For more information, see page 73.**



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